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American and Other Machinery Abroad—IX.

(Editorial Correspondence.)

ARMS MANUFACTURING IN BELGIUM.

As everybody is supposed to know, Liege, Belgium, has for generations been an important center for arms manufacturing. Many cheap Belgian guns are sold in America, M. Jansen having inaugurated the trade there by first securing a large order for Belgian guns. He was followed by others from Liege, until the trade became large and the English firearms were finally almost entirely driven out of the market.

I have spent a little time in studying this industry here, but am forced to confess that some features of it are as much a mystery to me as before I commenced.

SCATTERED FACTORIES.

In the streets of Liege you may frequently see, especially in the early morning, a small cart to which may be harnessed one, two or three dogs, who are directed by a woman (or the semblance of a woman) who also assists in the work of pulling the cart by a rope passed over her shoulder. In the cart may be what appear like rough blocks of wood, but upon closer inspection they prove to be gun stocks, which have been roughly sawn out to approximate form. This is raw material, which she has received either from a manufacturer of guns, to be returned completely shaped, or, in some instances, she has purchased. In either case she, and all the rest of her family, will work upon them from eight to fourteen hours per day—except Mondays, when they usually work much less, or not at all.

The work is done in the domicile they call home, and the wages earned may be, for the men, 2½ to 4½ francs (50 to 90 cents) for the full day; for the women and children, much less.

All the parts of a gun are made in the same way, and the gun is really assembled piecemeal. That is to say, a manufacturer may buy his barrels, and they will be taken in dog-, men- or women-propelled carts to the houses of workpeople, who bore them. They are then returned to the factory, and this work is paid for at a fixed price per barrel. Then, if these barrels are to be used for double-barreled sporting guns, other carts take them away again and bring them back soldered together in pairs; and finally, after numerous such trips back and forth between the so-called manufacturer and the various houses in which the work is done, the gun finally returns, practically completed. Its real approach to actual completion depends somewhat, however, upon how times are. If times are dull, and there is scarcely enough work to go round, the manufacturer can stiffen his neck somewhat and insist upon the work being pretty well done; in fact, he can refuse it if not well done. When times are good, and there is more than enough work to go round, the workmen have things a little more their way, and slight the work as much as possible, knowing that the manufacturer knows that they know that they can easily change to another manufacturer, who will be glad to have them work for him; and that to provoke them to make such a change by being too critical is a dangerous operation—one which may easily prevent the filling of important orders.

The manufacturer has in his place no power and no machinery. He has only a lot of bins in which parts of arms and complete arms are stored, a lot of inspectors who look over work as it comes in, clerks who keep account of things and some men who are his best workmen and who, when an arm has been carried as far as practicable towards completion by this domiciliary factory system, finish it; i. e., each one has a workbench and a lot of files and some reamers and some taps and he takes a gun and goes over it, and where the action is rough or hard he smooths it. If a standard shell goes too tight in the barrel he reams it out. If a screw is altogether too loose he selects a larger one, and if the only one he can find that is larger is too large, he runs it through a die or taps the hole with a little larger tap. For such work we would think our quick moving and convenient parallel vises indispensable. Here they use the old-fashioned wrought vises and prefer them. In one place I noticed the men always threw their reamers upon the floor when through using them. There was not much else upon the floor, and I am not sure whether this was the means adopted for clearing the flutes of chips, or was practiced merely because there was no room for the reamers on the crowded bench; which was not much if at all more than half our regular width.

GOVERNMENTAL INSPECTION.

At intervals between its other journeyings the gun goes to a testing establishment maintained by the government, where it is tested for strength of barrel, and in some cases such tests are given it from one to four times during its progress towards completion, the number of tests depending upon the grade of the gun; those for smokeless powder being submitted to the larger number. The testing is usually done by means of proof charges, which are fired from the arm, and the manufacturer pays a fixed price for each arm tested; all the money that is left over at the end of the year being returned to the manufacturers, to each in proportion to the amount he has paid in.

Very heavy penalties are imposed for any attempt to evade the inspection; any arm found in the market or in course of shipment to market without the inspector's stamp upon it subjecting the manufacturer to a fine of about $1,000 for the first offense, and for the second offense the penalty is imprisonment with loss of civil rights. This inspection does not extend to workmanship or to finish, but is intended as an additional safeguard against explosions of barrels.

SOME QUEER ARMS.

Some very fair, even good arms are made in this way, but many more that are considered good only by those who do not know what good in mechanical construction means—boys and savages, for whom, indeed, many of these arms are made—some of them with fantastic carving and ornamentation, including in some cases stocks painted a bright scarlet, no gun otherwise ornamented or finished being at all adapted to catch the eye of certain African tribes, who, though they will, for some inscrutable reason, buy none but red guns, immediately blacken them and carve then and inlay them with ivory,

according to their own notions of what is refined taste in firearms ornamentation.

SCREW MAKING.

There are about 160 such firearms factories in Liege, and many thousands of people are employed in the industry. Boys begin early in life at such work as screw making, and work for nothing, practically; their wages consisting of, say, three cents, given them on Sunday to enable them to see something of life. The screws they make are vile from our standpoint. The firm of Jansen Fils, which is perhaps more important and advanced than any other here of its class, tried, some time ago, to introduce standard screws for their work, and, naturally enough, bethought them that if they bought the screws and furnished them free to replace those that would otherwise have to be made by the workman, the standard screws would be given the preference. This turned out to be an erroneous thought; the workmen took the screws, threw them away and went on using the screws and taps they and their forefathers had been accustomed to.

SOME PRICES.

In one factory I was shown revolvers completely assembled and ready for the government test, which had cost the manufacturer, thus far, from 3 to 6 francs, according to size and quality; 5 francs, or $1, having been paid for an imitation of a Smith & Wesson revolver 32 caliber. These were unfinished and indescribably rough looking—in fact, as though made by people knowing nothing whatever of how to do a single really skilled mechanical operation; but the puzzle is in the fact that anything even remotely resembling a S. & W. revolver and made of steel could be turned out at such a cost and by such methods.

COMMERCIALLY AS WELL AS MECHANICALLY DIFFERENT FROM OUR SYSTEM.

The brothers composing the firm I have referred to, have travelled in America, read the "American Machinist" regularly, and have been influential in placing American machinery in other establishments; but they declare that, with the great variety of arms they must make, and the small number they can make all alike at one time, machinery would not pay, as compared with their present methods. They told me, for instance, that in a given American city it would sometimes occur that they sold guns to three or more dealers, and each of these dealers thought he was the only one in the city handling guns made by them, and each dealer required the guns sold by him to be a little different from others, or to have some peculiarity for the purpose of concealing its origin from his brother merchants.

There is at least one arms manufacturing concern here, however, which is equipped with machinery and tools for doing the work much as we do it; about half the machinery being of American and the balance of German manufacture. This establishment has manufactured arms for various foreign governments, and has had some good sized contracts, but is at present doing practically nothing in the way of arms manufacture, because no contracts are to be had. It is reputed to be the finest and best equipped manufactory of its class in Europe, and is called the Fabrique Nationale. Hart O. Berg, an American, who was formerly at Colt's Armory, is manager of it, and Ludwig Loewe, of Berlin, is the principal owner. I shall have more to say of it in future, and refer to it here mainly to make clear the fact that with this example of a firearms factory, equipped and managed in the most modern fashion, right in their own town, the bulk of the arms manufacturing of Liege is carried on in the manner first described, and my impression is that it would scarcely be safe to say that, under the given conditions, this system could be successfully changed. In America we would not attempt to make in the same factory a vast number of different styles of arms. Here they do, and think they must. If their system of carrying on the business, viewed from both its commercial and mechanical sides, could be successfully met in competition by our system, there would seem to be a golden opportunity for the Fabrique Nationale to try it. The fact that they do not do so, but seem to prefer such things as bicycle parts in the intervals between government arms contracts, is probably significant, as showing that our commercial system must accompany our mechanical system, and perhaps that neither can be successful without the other.

F. J. M.

Liege, Belgium, June 8th.

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The Place of our Destination—II.

Editor American Machinist:

In trying to cut down my first letter it was necessary to omit many things I thought worth saying, and I will now say in further explanation that I shall aim to make the letters instructive to the younger of your readers and at the same time interesting to the older ones, otherwise no fixed plan will be followed, nor will much attempt be made to make a continuous story.

To revert to the remarkable history of the Cunard Steamship Company's fifty-seven years' service without the loss of a passenger, it does not seem to me to have been a question of good luck, but the having of a motto "Safety Above All Things," and the living up to that motto, that has secured the result. No matter how well they get along one trip, everything has to be carefully inspected before another one is started. It is not only necessary to know that there are doors in the bulkheads or partitions between the different compartments, but it is known that the doors will work, not only when the ship is in the dock, but every other day during the voyage the doors are tested. In approaching the bar at Liverpool the anchor had to be run out ready for use, as much as if a storm had been brewing. Fortunately we had no fog or storm, but when necessary the watch is doubled, that is two men in the place of one, and search lights kept sweeping the sea, not so much, as I understand it, to see what is ahead, as it fails in this, but it shows other ships that they had better clear the way.

The engineer said that in running at half speed as they call it, which is 18 knots an hour instead of 22 knots, the ship could be handled with perfect ease and stopped in a little over its own length, whereas an 18 knot boat running at full speed could not be stopped in much less than a half mile. I expect the half speed is so-called because it only takes about half the steam, but when the ship slows down to have but little headway it is an unwieldy thing to handle. An ordinary steam tug trying to shove it up to the dock made headway very slowly, and the landing dock at Liverpool is not a dock at all but an iron barge, a hundred feet or so wide, from a quarter to a half mile long, to guess at it, and held in position by a lot of iron bridges of a hundred to a hundred and fifty feet span, fastened to the barge at one end and to the shore at the other. This allows the barge to rise and fall with the tide—ten or a dozen feet every six hours. The barge has large waiting rooms for the passengers and the bridges lead to the custom house. The custom house management is of the simplest and conducted so as to give the least possible annoyance to the passengers, if the passengers will themselves follow instructions and not get excited, but they always do get excited and act like wild people.

No matter what time of day or night the steamer arrives the custom house officers are there to attend to their duties, and as soon as that service is ended a London & Northwestern train stands adjoining to convey passengers to London. In this connection it is worthy of note that although we were not going on direct the railway company took our trunks just the same and delivered them at our hotel for a sixpence each, and that they will do whether the hotel is within ten rods or three or four miles of the station.

As soon as one lands he begins to learn that he is the foreigner and the other fellow the native. To an Englishman an American is a curious animal, and to an American an Englishman in his own country is hard to understand, particularly his English. Some of the enterprising agents give us a sort of dictionary in which many of the American names for common things are translated into English and although we learn that a grip or satchel is a bag, a trunk a box, a hack

a cab, etc., we always forget it when we want to use the call, but that is not the worst trouble; one who is not accustomed to the pronounciation finds it about as hard to understand as a conductor on a New York elevated railroad.

The London & Northwestern, not the only, but the most patronized of the roads leading to London, has a capital stock of $590,000,000, uses 2,700 engines, 70,000 passenger and freight cars and wagons, and 3,700 horses, and what the horses have to do about it is this: In undertaking to carry freight the railway company takes it from the shipper and delivers it to the consignee, so that while it is claimed that freights are higher in England than with us, many times it is quite the other way. In long distances it may be true, though in shipping engines from Syracuse to New York, about 300 miles, the cartage at the two ends of the line is almost exactly the same as the freight. As an example here that goes to show the incomprehensibility of the thing, parties in Glasgow wishing to deliver certain goods in London found that they could save money by shipping to New York and have them transferred to a London steamer, which was worse than our sending goods to Liverpool to get them to South America.

The railroad tickets are printed on the cheapest sort of cardboard—but good enough to use once—and then they have what is worth ten times as much to a stranger, the cost of the ticket printed on it—and this is universal with the street cars and omnibuses as well as for the trains. This, too, gives for all third-class tickets (which is the class carriages people travel in), the distance between the places the ticket is bought for, the fare being a penny a mile. Railroad men with us say this printing the price of the ticket on the ticket itself cannot be done, which, of course, is all nonsense.

The hotel arrangements and management are quite different. One doe not have to pay for what he does not have, and though the bill is long, it is a bill, and one can, if he thinks he has been swindled, see what it is on. As a general thing, he will find it not more than the same thing would cost him in any of the cities of equal size in the Eastern States. One might think that if the good features of the English system were combined with the good features of ours, it would make a model hotel, but the trouble would be that no one would patronize it. Our hotels are conducted as our people want them, and so with the English, at least they have lived here a good while and ought to know how they want to live.

In London it seems to me that no American but what must marvel at the cheapness of many things he finds here. A cab, "Hansom" or a "four-wheeler," always within calling distance, and a ride for two persons anywhere within two miles for twenty-five cents. Omnibuses coming from everywhere and going everywhere for from two cents for a mile or two to ten cents for ten or fifteen miles, I should think.

In this omnibus business one thing is certainly to be admired; they are made to carry twelve pasengers inside and fourteen on top, and the conductor will simply not let any more get on, and a ride on top of a bus through the three or four miles around the center of the city is a fascinating thing to many, and driving is an art. The underground roads which are undermining London in all directions, simply relieve the pressure, but nothing can take the place of busses and cabs. If the reader could be told how many busses there are in London he could have but little conception of the business without seeing them, and to say there are 15,000 cabs is about as incomprehensible as 1,500 or 50,000.

The omnibus companies have a way that seems to me pretty effectual to keep the conductors from cheating them. They furnish the conductor so many tickets of each price, for which he must pay. When he takes a fare he gives the passenger a proper ticket, punched, which is simply a receipt, telling where from and to, and the price. He can overcharge a stranger, but then he beats the stranger and not the company. He could, too, use counterfeits, but counterfeiting is too dangerous.

London is supplied with all means of travel. Nearly or quite a dozen main railway centers, a network of underground railroads driven by steam, and another system now partly running worked by electricity, and also cable and horse surface roads, and the fares variable from two to six cents. Not as simple as our single five-cent fare, but then they have no equivalent to our nickel, and seem to be willing to submit to the inconvenience if they can ride for a penny.

What strikes one familiar with the city is the preparations being made for the great Jubilee—to come off a month hence. They call it the Record Royal Reign. All the carpenters in London and the country around about are building stagings for seats. Every available space around churches, in front of public buildings, and even the floors of fine stone front buildings like the galleries of theatres are being rigged up for seats, and the fronts are to be taken down and carted off with the intention likely of restoring them after the show is over. Unless all who ought to know are mistaken it will pay. Three hundred and eighty seats in one place have been sold at an average of $450, and one seat alone was bid off at $2,362.50.

One American lady could not rent what she wanted, so she bought the place, and it may be it was this incident that has led to the belief that these high prices are to be paid by Americans..

Anticipating the disastrous result that the Queen's death before the 22d of June would occasion, speculators and merchants who have laid in stocks of goods have insured her life.

I am aware there is nothing mechanical about this letter but a staging, but then a staging is something.

JOHN E. SWEET.

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Friction Drill Tapping Chuck.

The chuck shown in the half tone is designed for use in an upright drill which is provided with a backing belt. It might be very properly styled a safety chuck. The body of the chuck contains a simple

FRICTION DRILL TAPPING CHUCK.

friction device which may be readily adjusted to any desired tension by means of a common screw driver. When used for tapping the chuck drives until the tap reaches the bottom of the hole, or is otherwise obstructed, when the driver slips instead of breaking the tap, and the spindle can then be reversed and the tap withdrawn. The spindle has a square hole and several sockets for different sizes of drills or taps are provided which are instantly interchangeable. The chuck is made by the Union Tire Company, Plainfield, N. J.

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"Gossamer" iron, it is stated, is made at Swansea, Wales, only 1-4800 inch thick. The average leaf of a book is 1-200, or twenty-four times as thick. We are not told what the iron is used for.

Bicycle Chain-Link Presses.

We illustrate herewith two presses for making the outside links of bicycle chains, which have some points of novelty and interest.

The first or blanking press takes the stock in a ribbon, punches out the links and makes the holes. A pair of feed rolls will be seen each side of the gang of punches, the rolls being operated by an adjustable crank on the main driving shaft, with a chain of connecting rods and ratchet gear. The crank is so placed as to operate the rolls during the time that the punches are outside the work. The dies are in two sets, the first are to meet the work, making the holes as shown at

Fig. 2

ACTION OF THE DIES.

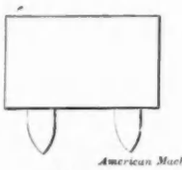

Fig. 3

PUNCH WITH PILOT PINS.

Fig. 1, one for each upper feed roll, are operated by the descending ram, and loosen the bite of the rolls on the stock, thus permitting the pilot pins to center the stock without resistance. Hand wheels will be seen attached to the lower rolls, which are for the purpose of quickly feeding in a fresh piece of stock, and for getting rid of the waste end of the previous piece, without waiting for the step-by-step feed of the machine. The hand feed also insures that the first link shall be a perfect one, and avoids danger to the dies which might be experienced should the feed roll deliver the strip for the first cut in such a position that the punch did not make a complete hole. The ratchet feed

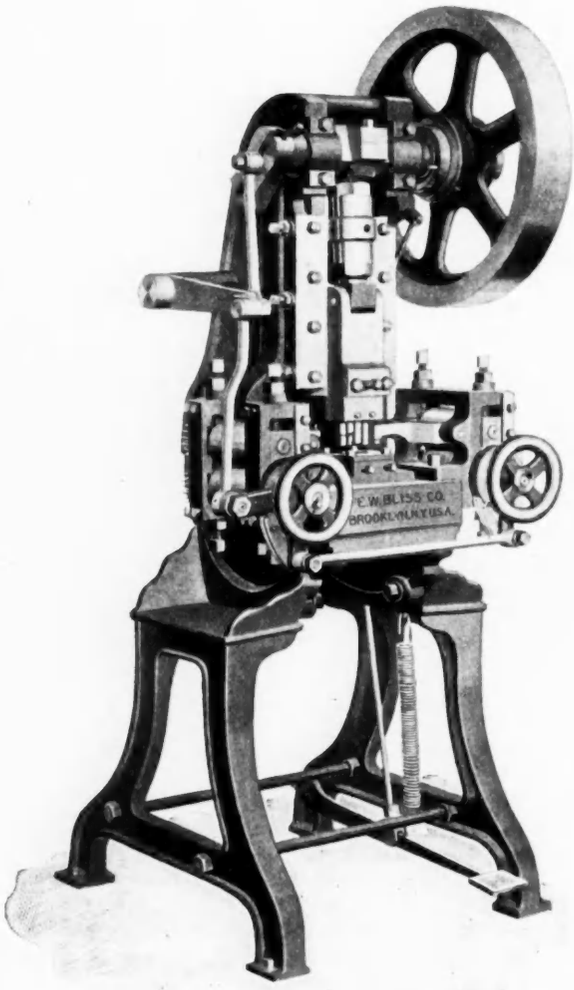

Fig. 1. BICYCLE CHAIN-LINK BLANKING PRESS.

Fig. 4. BICYCLE CHAIN-LINK FINISHING PRESS.

the left of Fig. 2; this portion of the stock being fed forward during the next upward stroke, so as to bring it in position below the second punch for cutting out the link. After the first link, the action of the two sets of punches is simultaneous, so that a complete link is made at each stroke. It is, of course, necessary that the feed should be exact in order to have the holes properly placed under the second punch, and this is secured by the device shown in Fig. 3, which is an elevation of the second punch. Two taper pilot pins are attached to the front face of the punch, the feed of the rolls being sufficiently accurate to insure the small end of these pins entering the holes. After they have done so, two levers, shown in

of the rolls presents the hand wheels to be operated without interference with the automatic feed and without disengaging any clutches.

The second machine performs the finishing operation of trimming the link, countersinking the hole and stamping the maker's name on the link. The links, as delivered by the first machine, are placed

by hand in the vertical trough seen at the left side of the frame. The lower end of this trough is raised sufficiently above the horizontal guide to permit a link to slide out, and a horizontally acting plunger, operated by the bell crank and link work shown, delivers one link at a time below the dies, where the link is completed.

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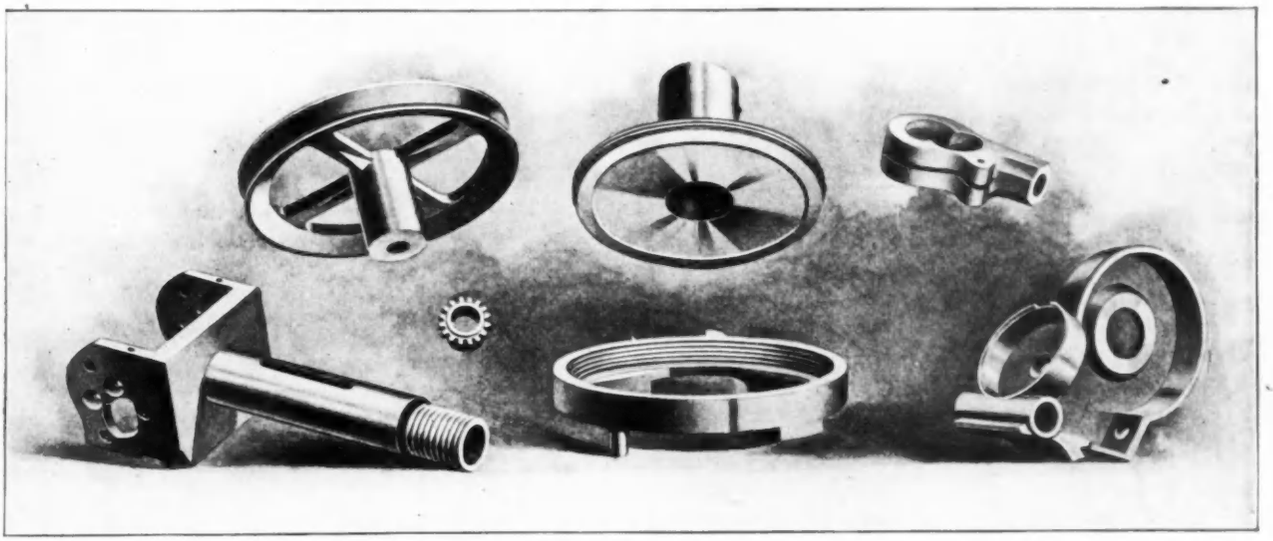
Casting Extraordinary.

We illustrate herewith some extremely interesting foundry products which are remarkable not only for the forms produced, but likewise for their accuracy, as they are intended to dispense with machine work and to be used as they come from the foundry. The illustrations speak for themselves, especially those showing screw threads. These threads have been made in the mold, and are as good a fit as is customary in ordinary brass work. The general surface of the castings, which, of course, pictures do not indicate, is excellent. They have not, of course, the bright finish of tooled surfaces, but they are surprisingly smooth and true. The only thing about them which indicates their origin is a slight fin at the junction of the parts of the molds. We are not informed of the composition which enters these castings, but judging from their weight and color, it is an aluminum bronze. Two grades of this are shown, one having approximately the strength of cast iron, while the other is softer. The strength of the stronger mixture is shown by the grooved pulley, which is 2½ inches in diameter, and when placed on the floor, hub down, will sustain the weight of a man standing upon its rim. The samples from which our engravings have been made have been supplied to us by the H. H. Franklin Manufacturing Company, Syracuse, N. Y., and they are certainly highly interesting examples of the founder's art.



"ROUGH" CASTINGS.

The Latest from the "Sleepy Eye" Engine.

From the enclosed, which we are permitted to reproduce, it will appear that the Sleepy Eye engine is wide awake and still seeking whom it may devour. It is at least a unique example in the way of computing steam engine possibilities upon unwarranted data.

Wathena, Kan., June 7, 1897.

H. H. Perkins, Esq., Kewanee, Ill.

Dear Sir—Your name was given me by Mr. L. P. Krauss, Beatrice, Neb., saying you was a man that could see merit in anything that had merit in it. I have the sale of the Bramble rotary engine, of which I enclose papers of patentee.

If you are open for a trade and see merit in this, I will give a good trade, or such a one as should be handled. If this engine will do all he claims, it simply means a monopoly on a gigantic scale, as I will set forth his claim: It will cost 75 per cent. less to build than any other; 75 per cent. less freight than any other; 75 per cent. less expense setting, and wear 50 per cent. longer than any other; to take 50 per cent. less attention than any other; save 25 per cent. more fuel than any other.

If you should become interested and will buy an undivided half, will sell, or will let it out on $1 per horse-power royalty, and I would like the Western agency for selling same. For instance, I know one plant that is using $75 fuel daily, and we could save $19 a day, or say, $7,000 a year. Why would it not be a good thing to put an engine in that would not cost much over $1,000 set up and contract with him for ten years on all we save. Showing him it would save his boilers 25 per cent. in steam and much more in repairs in ten years with compound interest we would get $100,000 for the engine. I only call attention to one plant, and there would be no end of revenue from the enterprise, if as represented. Mr. T. H. Pagenhopp is deputy boiler inspector of Minnesota. If not interested, send all papers back. If interested, let me hear from you.

E. V. Snively.

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Cocaine for the Eyes.

It may be proper for us to offer a word of caution upon the use of cocaine for the eyes. In our issue of March 25th an interesting contribution upon shop eye doctors contained the following: "The use of cocaine is now so universal, and the operation of removing foreign substances rendered so much easier by it, that I never think of trying for a piece without it." Details were given as to the mode of applying the cocaine, and the natural tendency of the article would be to promote the use of the drug. Cocaine has recently been used in the cases of great fires in this city, to make the eyes of firemen less sensitive to smoke, and the use is condemned by some experienced physicians as unwise. It is said that "not only was it likely to produce a victim to the cocaine habit, but that when used often cocaine kills the fine sensibilities upon which the eyes depend." "If it did deaden the sensibilities of the eyes for the time being, it would not prevent injury to them by the smoke." We have seen hundreds of cases of successful eye surgery in the shop before cocaine was known, and it will be well to be slow and cautious about using it. In cases where its use would be necessary it would be a case for the professional oculist to handle. The fine sensibility of the machinist's eye is too valuable to be trifled with.

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The new rules of practice in the Patent Office have been abrogated by Commissioner Butterworth, and the original rules as in force April 1, 1892, have been reinstated. Some amendments, especially relating to the qualifications of patent attorneys, have been added.

Present Status and Prospects of the Motor Car.

As our readers are aware, the road race or trial of motor cars arranged for by "The Engineer" of London, and for which liberal prizes were offered, was, after all, abandoned. The following are some of the comments of "The Engineer:"

There is no such thing as a thoroughly satisfactory self-propelled vehicle. If a motor car of the kind had existed it would have been submitted for competition. We have received dozens of applications to postpone the trial. The period of delay asked for varied between one month and one yar. It will be remembered that several months have elapsed since the world was assured that the construction of motor cars was a flourishing industry. Already we had put off the date of trial from October, 1896, to June. 1897. We have every reason to believe that the best that England can do at present was shown at the Crystal Palace on Monday; and, in the opinion of three most competent engineers, the carriages shown were so imperfect, so unsuitable to the fulfilment of the purposes which a motor car ought to serve, that they would not submit them to further trial.

We have no desire to find fault; and to point out shortcomings is a thankless and wearisome task. At the same time it is impossible to let the occasion pass without drawing lessons from it that may be of the utmost value in the future. To us it appears certain that a new departure must be made by designers of motor cars. The oil engine and its congeners is not suitable for the purpose in its present form.

We have no longer any faith in the use of heavy oils for motor cars, and we shall go so far as to say that time and money are being wasted in the attempt to produce such cars on existing lines.

And here attention may be called to the fact that Coventry would not run the risk of sending even one of the perfected machines which we are assured are being made, presumably for stock—for no one seems to buy them—to take part in our competition. The world has been assured that Daimler carriages have not been sent because they were "shut out by the rules from competing in any but a minor side class, to win a prize which is of no value." We think that to earn even a good word from men of the reputation possessed by the judges in this competition would be of the utmost possible value to any motor car makers; and we have no doubt that the fact that Coventry has been entirely unrepresented will be estimated at its true value. We, ourselves, do not believe that there is any motor car industry, properly so called, carried on at Coventry for other than company promoting purposes—a possibly remunerative, but scarcely legitimate branch of engineering.

Leaving oil engines, let us turn to the two vehicles highly commended by the judges, namely, the electric tricycle car, shown by Mr. Blackburn, and last, but not least, the steam van of the Liquid Fuel Company. The electric car is an ideal motor carriage; no dirt, no smell, no noise; steered by a pair of reins; its power adjusted by a slight motion of the seat beneath the driver. It was enough to see this vehicle running quietly about the grounds, up hill and down, without the smallest hesitation or trouble, to be convinced of its merit. In the details of its mechanism it is simplicity itself; but, alas! it has the fatal defect that it cannot store electricity enough for a run of more than about twenty miles. Yet, even with this limitation it is difficult to believe that there is not a future for the electric motor car.

The steam van is beautifully made, the workmanship is superb; but it has the great defect, that it can only be driven and managed and kept in repair by a skilled man. In the grounds of the Palace it was manoeuvred with wonderful skill. But the driver has no fewer than seven handles by him, all needing attention, to say nothing of several others which may be regarded as emergency cocks and valves. So far as we can learn it has hitherto always been driven by one man, and steered by another sitting beside him. How far such conditions are likely to satisfy the desires of a draper or a grocer our readers must judge for themselves. While this van is running it is fairly silent, but when standing there is the continued muffled roar of the petroleum flame going on, and when starting a dense cloud of steam is given off until the van is fairly under way and frequently there is smoke emitted. Such a vehicle might very readily be extremely offensive in our streets.

The motor car has yet to be made. It may be that it has not as yet been invented. This we say with a full appreciation of what has been done in France. It must not be forgotten that what will satisfy our French neighbors will not at all satisfy public opinion in this country, which is much more exacting. And then after all comes the question—are motor cars wanted? Will there ever be so full a demand for them that money can be legitimately made out of their manufacture? There are not lacking those who assure us that the motor car has been slain by the tram car and the bicycle. Time alone can settle the question. The world may rest assured that if a motor car is really needed it will in time be produced; English engineers are not readily beaten.

But if in England the engineer can do anything, it must not be forgotten that public opinion in engineering matters is swayed by engineers. In the long run all mechanical questions will be decided, not by an uninstructed public, but by engineers. The verdict pronounced by Sir F. Bramwell, Mr. Aspinall, and Dr. John Hopkinson on Monday, will not, in the future, remain without a parallel or an analogue. It is by the decisions of similar courts that in the end the inventor and maker of motor cars will have to stand or fall.

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What the Average Molder Don't Know.

BY R. D. MOORE.

With a few exceptions he don't know what regulates the pressure of the liquid upon his mold, or how much weight is requisite to resist it, the true working of the feeding process, or how many heads to use on a heavy casting, why castings warp and break, or that the strain is usually exactly contrary to the unequal shrinkage actually occurring in the case. He don't know how utterly useless is the universal practice of lighting vents to prevent blowing and scabbing, nor the true theory of a skim gate for catching the dross when a clean casting is wanted. He don't know how to blow sand out of a pin hole without getting it in his mouth.

He don't know the law on which iron breaks, and consequently don't shape gates that will break off neatly or exactly in the right place. He don't know the true theory of scabbing—two distinct kinds. He don't know, when pouring a cog wheel with a hot and a cold ladle of iron, which to pour first, but will pour exactly contrary to the true course. He shapes his fins for strength when they should be shaped to break off easily and neatly, remain whole and be saved instead of being crumbled into chips and lost. His fins, when broken, tear in.

He don't know the true thickness to make a pouring sprue, in the side of a pipe, for example, nor the safe thickness to make a feeding sprue in steam chest, for instance; nor what regulates the time required in a given weight of casting to cool to a solid state, nor, consequently, length of the feed required in the case.

He don't know that a shaft two feet long requires a larger feeder to make a sound casting, than a shaft, same diameter, ten feet long.

He don't know the lift on a core given by the metal, when pouring a casting; nor at what point in a pipe mold to set his anchors, to divide evenly with his prints, the office of holding down the core; nor where to place the two trestles under a long cope to give the least strain to the cope, and is equally at sea in placing the lifting straps under a long core.

He don't know how to shape cast-iron flask handles to secure the greatest strength from the metal employed. During sixty years of foundry life the writer has never found a flask handle that would

stand the common usage of a foundry. I take pleasure in confessing that the worst specimens I ever saw were evidently copied from Fred. Overman, a noted mining engineer, who wasted much good printer's ink, fifty years ago, on a book of instructions for molders.

The average molder don't know about the shaping of cast flask pins to get the greatest efficiency; that a low rib on a plate warps the plate more than a high rib; nor why the shrink strain breaks a curved, and therefore yielding pulley arm, easier than a straight, and therefore rigid arm.

He don't know, when he attempts to straighten a long, crooked casting, when to set his gage bearings, nor when to put on his weights; nor how to draw, or increase the face of a spur pinion, or bush, and get the face exact to the order. He don't know that a moderate blow can be stopped, often by a little rise in the gate, putting on more pressure, blowing being a question of pressure given by two opposing forces.

Very few molders know how to set a whirl gate, on a roll neck, for example, to get the greatest efficiency; the writer has witnessed a number of complete failures in the hands of old and reputable molders. The molder rams the wrong bars first in a pulley cope, resulting in a cracked mold and many triangular drops. He has not discovered that he gives his copes a very severe twist when he "lays back" or "raises up," by not dividing his men, often having one or two men lifting against nobody. He often don't know how to roll a drag within the least possible space, nor how to drive his rolling clamps, to hold best. Did any molder ever discover that if all the clamps on a long flask, for pouring, were leaned out one way, it would depend on the pins if they hold the cope down under a heavy lift? He don't know how to make a true sand bed with one straightedge. Kettles, cast bottom down, are run with a flat draw gate, say one inch by four, set horizontal, and, on account of the angle in which it meets the kettle bottom, if broken off with the usual sledge blow it will leave a three-cornered stump standing out about three inches; they can be broken off nearly clean, but most molders, or other mechanics, don't know the right spot. And many other don'ts.

[What, then, does the "average" molder know?—Ed.]

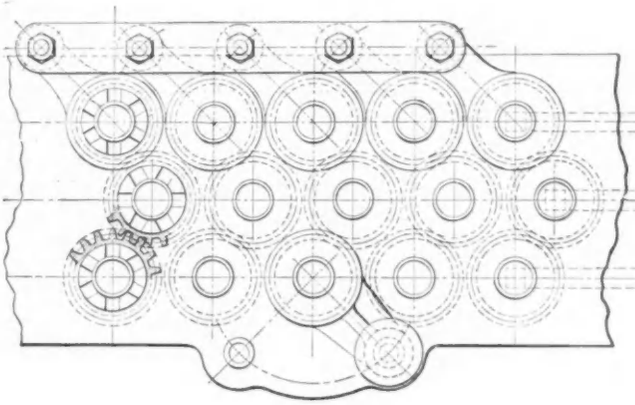
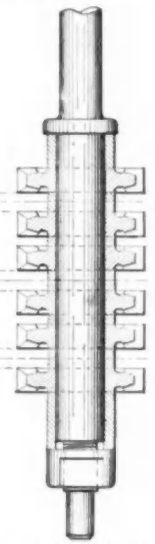


Fig. 1

ARRANGEMENT OF TAP HOLDERS.



American Machinist

Fig. 2

SANG OF MILLS.

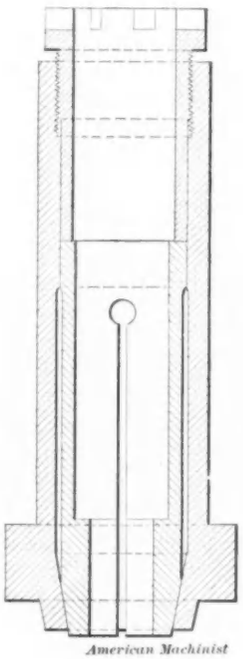


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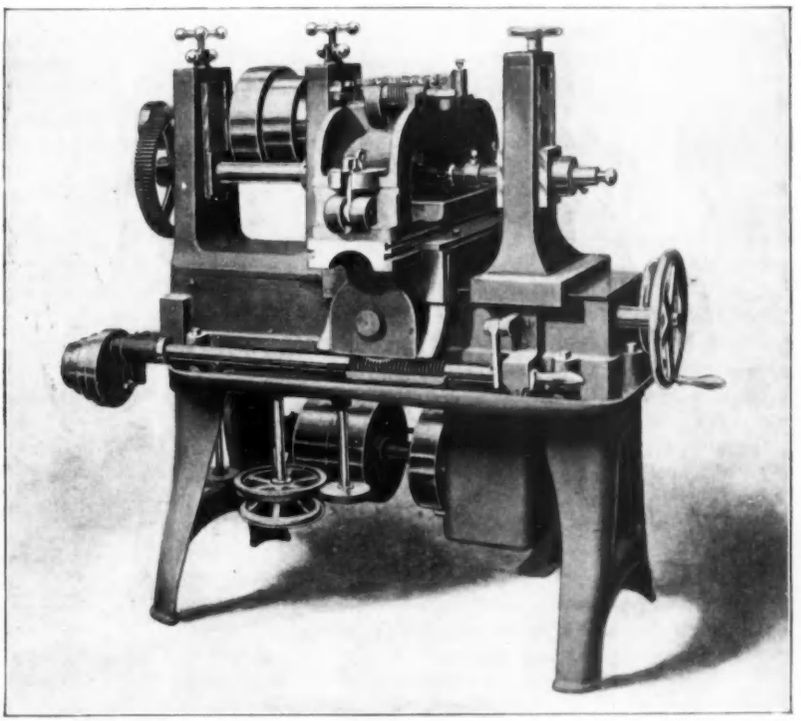
Fig. 3

CHUCK FOR THE TAPS.



TAP SQUARING DEVICE IN USE.

Tap Squaring Device.

We illustrate herewith a device recently put out by the Garvin Machine Company, of New York, for milling the square heads of taps, reamers, etc., or for bolt heads, nuts or similar articles. The arrangement is mounted on a regular No. 2 Lincoln miller, as shown in the half-tone. Fig. 1 shows the arrangement for chucking fifteen pieces at one time, the pieces

being held in a spring collet chuck, Fig. 3, and mounted in a swinging fixture which allows the pieces to be easily removed. The gang of cutters, Fig. 2, revolve below the work, and in a trough of oil, so that the oil and chips do not run over the work. Two sides of each piece are milled at a time, and then they are turned all together, 90 or 60 degrees, according to whether the work is square or hexagon.

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Tool Room Management.

At a recent meeting of the Providence Society of Mechanical Engineers, Mr. D. D. Donovan, who has charge of the tool room of the Brown & Sharpe Manufacturing Company, read a paper on the management and arrangement of tool rooms, and from it we abstract as follows:

The subject of a properly equipped tool room has engaged the attention of manufacturers for a long time, but its importance is hardly yet fully appreciated. When the shop manager conceives the idea of establishing a tool room, he too often looks around to see where he may find a dark corner that is good for nothing else. That is the greatest mistake. A tool room should have good light, so that the time of the attendant may not be used in poking around in dark corners after tools that the workman is waiting to be supplied with, for it must be borne in mind that while he waits his pay goes on just the same; but there is no profit derived from the product of the wait. While he waits there may be others waiting for him to get out of the way so as to secure their turn next, when the same process is gone through. So that the lay-out of the tool room is an important element of its make-up if it is to subserve the purpose for which it is designed, and that purpose is to keep ready at hand tools that are the best suited to produce the work required to be done, and will vary, of course, according to the nature of the work; the tools required in a locomotive works would not be of much use in a sewing-machine factory.

The aim of the progressive mechanic of to-day is to produce the most at the least cost, and a properly equipped tool room is an important factor in accomplishing that result, for, with a good supply of tools ready at hand, the machines are kept running instead of standing idle while the workmen visit the smith shop and perhaps stop to listen to the latest yarn.

The location of the tool room should be central, so that it may be easily accessible from all parts of the shop. I have in mind a case where a workman presented himself at the tool room window so often during the course of one afternoon that the attendant noted the number and reported, and on inquiry it was learned that he had been sent to the next floor to make some repairs on a machine, and he was obliged to go back and forth quite often to secure the tools required for the job. This incident illustrates two points; one is that where the works extend to more than one floor there should be tool rooms on each, or else each floor connected by small elevators or dumb waiters with the tool room, which method is adopted in some shops, and if properly carried out, works with a good degree of success. The other point is, the lack of forethought of the ordinary workman, for it would seem that a man, after looking over the work he was expected to do, would be able to select what tools he would require to repair a machine when the work required only a few hours' time.

Having selected the best available location, don't crowd too much into a small compass, for you will find that, having embarked in the tool-room business, tools will begin to accumulate, and pretty soon you will have so much stuff in your tool room that the attendant will not know where to look for anything. Take about twice as much room as you think you may need, and then it will not be long before you will wish you had more, and will be looking around to see how you may be able to make an extension.

The matter of fitting up the tool room so that the tools may be readily found and handed out to the workmen is next in importance; for while the attendant is searching, the workman is waiting for the tool, and the machine is waiting for him, and all for the time being are non-producers. That is the only point that can be possibly brought up against the tool-room system—the cost for attendance and the waste of time by the workmen in obtaining the tools required—but I am firmly of the opinion that it will have a large balance in its favor as compared with having tools left promiscuously around the shop, dropped wherever they happen to be used last, nobody knows where, and not fit to be used when found. The tool-room attendant should be capable of knowing, when a tool is returned to the tool room, whether it is in a fit condition for further use, and, if need be, should have it repaired so that it may be ready when again called for.

Avoid drawers and cupboards as much as possible. Have everything possible in plain sight, within ready reach of the man in attendance. Drawers for drills, reamers and tools of that character soon get shaky and in need of repair, no matter how strongly they are constructed, and unless there is a separate compartment for each tool they are liable to injury from contact with each other. The open shelves are to be preferred to sliding drawers, being less expensive, both in original cost and in repair.

Revolving turrets for holding cutters, drills, reamers, counterbores and such tools are very convenient, as they may be so arranged as to hold quite a quantity of tools, and all within easy reach of the attendant, without leaving his position at the delivery window.

One turret may be arranged for holding all the cutters that may be required in quite a large establishment, and be located so any cutter may be reached by the attendant without leaving his position at the delivery window. This form of turret is in use in the Brown & Sharpe Works, and is familiar to most of you. It is hexagon in shape, and is held in place by a vertical shaft, while the weight comes on balls which run in a circular groove, on which the turret revolves with ease, even with considerable weight.

No tool room is complete without a check system, so that the tools may be located when not in their place in the tool room. These checks are usually made of brass or German silver, about 1 inch in diameter and 1-32 inch thick, with a hole punched near the edge to attach to a ring; these checks have the shop or drawer number of the workman stamped on each side, and are left and retained in the tool room in exchange for tools taken out. They answer the double purpose of making the workman more careful to return tools when they are through with them, and they serve as a means of locating the tools when they are needed by someone else. The workmen are usually supplied with ten of these checks, which number is found, from experience, to meet the wants in most cases. The checks should be stamped with good-sized figures, so that they may be easily distinguished by the tool-room attendant, else he may be liable to hand the man the wrong check and cause complications that sometimes give trouble.

Checks may also be used for another purpose—that of charging supplies, such as oil, waste, emery cloth and other supplies that it may be thought advisable to keep in the tool room for distribution to the workmen. When the workman is aware of the fact that an account is kept of the amount of such things he is supplied with, it has a tendency to check useless waste. This form of check is numbered the same as the tool checks, but are also stamped so as to distinguish them from the tool checks, as they do not go out of the tool room, but are taken out of the receptacle they may be dropped into when making the charge, a record made and then used as before, stamped with "T. R."

The tools that may be advisable to keep in tool room include all cutting tools not in actual use, such as drills, reamers, taps and counterbores, etc., with a sufficient quantity of wrenches for use with taps and reamers, milling cutters, bolts and straps for planers and face-plate work on the lathe, and innumerable other articles that will vary according to the class of work done in the shop. A convenient method of keeping taps is in a hardwood block in which is also kept a tap and size drill, a counterbore and wrench suitable

for use with the taps, so that the whole set required for putting in a certain size screw may all go out on one check. If these tools are kept in separate places it will require several checks to secure the whole set, and they are generally required at the same time. These blocks may have holes drilled in them to receive the shank of the tools so they will stand in a vertical position, with a pin in the center to keep the wrench in place in a horizontal position.

For files, a cupboard is suggested with about 125 separate pockets, which is capable of holding about 500 varieties of files. Of the Swiss files, take the pillar; you can keep the different grades of the same width in the same pocket. There will be, for instance, ⅛ inch wide, Nos. 0, 1, 2, 3, 4, 5, 6, and the length will run 2, 3, 4, 5 and 6 inches, making 35 different files of that particular width. Then there are the 3-16, ¼, 5-16, ⅜, 7-16, and ½ inch widths of the pillar, making in all 210 files; then come the hand, half-round, round, barrel, knife and a number of other kinds. But it is not necessary to carry all of the different kinds, if the stock is selected to meet the needs; a cupboard such as described will answer very well for a concern employing 500 to 1,500 men.

Too much care cannot be exercised in purchasing files, for with a little carelessness in purchasing, you are liable to accumulate a stock that will be practically worthless, as the only time you know of their existence is when taking account of stock, when they loom up on the balance sheets in huge proportions.

The advisability of recutting files has been discussed more or less; you will find that the recut files will give as good results, so far as quality goes, as new files, with a saving of about one-third from the original cost; but the use of files has been greatly reduced since the grinding machine, both surface and universal, has become an important factor in the machine shop for finishing surfaces.

It is an open question whether tool making and repairing should be done in the tool room, or in a separate department; at any rate, there should be close connection between them, so that the person in charge of the tool-making should have a general oversight of the tools and see that they are kept in proper condition for use when required. In speaking of a tool-making department, I do not wish to be understood as being in favor of making all the tools for the tool room, as many of them are commercial articles and may be purchased more economically than it would be possible to make them; but with the present methods of building machinery, special tools are necessary, where the machines are built in any quantity. Jigs and fixtures are required that may be expensive in themselves, but are largely instrumental in reducing the cost of the parts, and after the fixtures are once made they represent so much capital, and wear on them is usually slight.

The tendency in modern shops is to so subdivide the work that the parts may be made in different departments, without any regard, so far as the workman is concerned, to any connecting part. The foreman must look to that and provide suitable tools and fixtures so his plans will not miscarry. For instance, there are many of the small parts of machines that may be made more economically on the screw or turret machine than on the lathe, for with proper tools, with cheaper help, you secure more uniform results. The same is true in regard to the chucking of holes; the lathe is not in it with the chucking machine, with its turret head, if properly provided with tools.

The grinding department, without the aid of file or emery cloth, will finish your shafts and spindles, so that when the parts finally reach the assembler the matter of fitting will not cut a very large figure in the expense account. This method of doing the work in separate departments is objected to by some for the alleged reason that it reduces the value of the all-round workman, and he is disappearing from the shop. There may not be so much of an opportunity for the machinist to learn how to chuck holes, but there is an opportunity presented to him to learn what may be of more advantage to him, for there has never been a time when thinking men have been more in demand in the shop than at present.

A properly conducted tool-room department may be of great assistance in keeping the shop abreast of the times in regard to the kind of tools to use and the methods employed in getting out work economically. Take the simple matter of reamers; nine-tenths or more of the shops to-day use the solid reamer, that after being used in a few holes lose the size. You do not feel like throwing away the reamer, and the only alternative is to fit each piece to the hole. There is no excuse for this manner of doing work, when the list price on a solid reamer, 2 inches diameter, is $8.30, and on the best type of an adjustable reamer of the same size is $10 with about 25 per cent. off, so that you may purchase a 2-inch reamer for $7.50 that is good for more years than is represented by the dollars you pay, for with ordinary care it will ream as many holes of that size as most shops will ever need. We have one in use in our chucking department that has been in use for more than ten years. It is 1¼ inches diameter, a size that is used very much; it is safe to say that it has reamed many thousand holes, and the end is not yet.

Fig. 1.—This reamer is made of soft machinery steel with inserted teeth of hardened tool steel of the best quality. The teeth are slightly dove-tailed with a taper wedge under each to provide for enlargement when it wears below size. (See cut for general appearance.)

The method of manufacture is to turn the shank to a size suitable for grinding; then mill the slots for the teeth and wedges, the proper depth and the same taper as the wedges, the width of slots to be the same as the thickness of the thinnest edge of the teeth to be inserted. Then set the shank parallel, and with a small face cutter mill the slots to fit the teeth, a close driving fit; the teeth having been properly tempered and driven into place, the wedges are inserted. To secure a more perfect fit, the stock may be wedged down against each tooth with a round edge chisel, the wedges projecting about ¾ inch, after which they may be driven into place and the teeth ground to size, leaving about .001 large for backing off, and stoning to proper size for the hole required. The reamer should, when finished, measure about .0005 inch larger than the plug that is to gage the hole; if the reamer is made the same size as the plug, the first two or three holes reamed may be large enough, but it will soon get too tight a fit, and will have to be adjusted. The operation of stoning to size is important, and requires to be done with care; the teeth should be stoned just enough to remove the grinding marks from the cutting edge, and no more. It is advisable to make the reamer about .0005 inch smaller at the rear end of the teeth, so that the cutting will be done at the entering end, which is tapered from ⅜ to ½ inch long, and this taper on the end of each tooth may be about ½ degree, which will make the end small

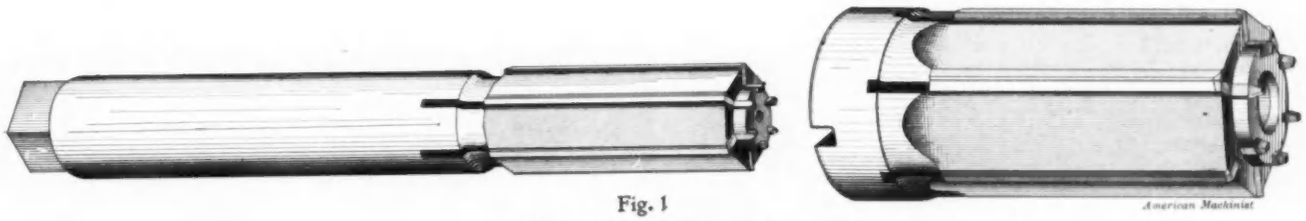


Fig. 1
ADJUSTABLE REAMERS.

enough to enter the hole to be reamed, as the amount of stock for a finishing reamer to take out should not exceed, in ordinary cases, .005 inch, and in steel and brass a less amount will often give a better result; this is on the assumption that two reamers are used, which is advisable where a close fit is required. The reason for making the reamer slightly tapering, decreasing in size towards the back end, is to secure a straight hole; for if the reamer is guided central, the teeth will do no cutting except at the front end, and this result may be secured by following up the reamer with the center, if the work is done in a lathe or chucking machine, or the reamer may be made with a guiding tit to secure perfect alignment when holes have to be reamed otherwise, in which case about the same result is obtained as in reaming with a jig.

All holes should be made to a standard within safe limits, so as to avoid the expense of fitting parts together until it comes to the assembling. Some may ask, what is a safe limit for the purpose? That will depend on the nature of the work, whether it is a running fit or a driving fit, or where the parts are keyed and held with a nut.

For close running fits in cast iron the ordinary limit is .002-.001 inch above to .001 inch below standard, having one end go in the hole freely, and the other end not go in. The hole must, of necessity, be between the two extremes, or about standard size. In some cases we have a limit of .0005 inch under to .001 inch over size, with the limit reversed on the gage for the shafts; in other work on steel the plug may be made with a limit of .001 inch, with both sizes ground on the same end of the plug, the smaller size to enter the hole until the maximum size is reached. With adjustable reamers there is no trouble in maintaining a standard even closer than I have stated. This reamer is just as reliable as a solid one, and the cost of keeping to standard size is very slight; when it gets so it makes a hole that is too tight a fit for the plug, it goes to the tool-maker, and in from ten to fifteen minutes it is again ready for use.

You may require in some cases a reamer 2 feet long to ream a hole 2 inches long; the cutting teeth in such a case need not be any longer than the hole to be reamed; if you can make the shank of soft machinery steel the difference in cost between that and tool steel will go a long way towards paying for the extra labor required to put in adjustable teeth, and you have a reamer that will last for all time for the work required of it. This may be a case where there are two holes in opposite sides of a machine frame which require to be in line, and in some cases it is practical to ream holes at once by making the reamer double. This style of adjustable reamer is practical down to ¾ inch diameter, and as large as you may have occasion to use, but the larger sizes are usually made in the shell form and used on a shank. From ¼ inch to 11-16 inch, inclusive, the French expansion type is recommended if you wish to keep to standard size.

In regard to grinding reamers, the Pratt & Whitney method is to grind a circular clearance, while the Morse people grind a flat clearance; others recommend lapping the reamer to size with emery. That method may be resorted to in extreme cases, and then only with rose bits where the cut is on the end only; but for reamer teeth I prefer the double cut on the top of tooth, as that method gives as strong a tooth as the Pratt & Whitney method with less expense. Some advocate an uneven number of teeth in reamers for the purpose of preventing chattering. It is a fallacy. A reamer with even or uneven teeth will chatter under the same conditions. If a reamer is properly made and is started in the hole without wobbling, there will be no trouble in that respect. The reamer should do all its cutting near the end, where it is tapered about ½ degree, and then tapered the other way about .0005 inch to prevent the teeth taking hold anywhere except at the cutting end; this applies to straight reamers or reamers for straight holes, whether long or short. When you come to taper reamers, you then have another problem altogether. Where the reamer may be cutting the whole length of the tooth it is readily seen that chatters are more likely to occur, but in this case an uneven number of teeth will not help you, as you get the same conditions as with an even number; each tooth is following in the wake of the other, which is what causes the chatter, and the hole will sometimes look like a hexagon or an octagon, according to the number of teeth in the reamer. You may prevent this to a large extent, if not altogether, by cutting the teeth uneven, so that no tooth will follow exactly in the wake of the preceding one. Then, instead of plowing furrows, you secure a round, smooth taper hole.

Where practicable, the shank of the reamer may be held steady by a center when the work is done in a lathe or chucking machine, until the reamer enters the hole sufficiently to steady itself, when the work may be taken out of the chuck, and the reaming finished by other means, if the piece is not of sufficient size to resist springing by the chuck jaws.

For general chucking machine work, the hole may be finished before taking it out of the chuck or fixture in which it is held.

The usual tools employed are a drill if the piece is solid, a pin or boring tool if cored, to remove the scale and make central, then a four-lipped or roughing drill, followed by what is called the machine reamer (which may be from .003 to .006 inch below standard size, according to what the work may be) and the adjustable reamer for finishing. This reamer is sometimes made with a floating shank, so that a slight variation in the alignment of the spindle and the turret may not affect the work; this floating shank consists of a socket with a hole about 1-32 inch larger than the reamer shank, with a driving pin to hold in place. This pin is a driving fit in the socket, but the hole in the shank that it goes through is reamed a little large and slightly tapered at each end to prevent cramping. R. Hoe & Co., New York, printing press manufacturers, use this style of reamers in chucking machines with good results, though, to the best of my knowledge, they originated in the Brown & Sharpe Works.

Chucking holes is not tool-room work, but it is referred to here to illustrate how the tool room may assist in producing work in the different departments with the best results.

Equipment for the tool room, of course, will vary according to the needs of the establishment; but the universal milling machine and first-class tool-maker's lathe are the first requisites, and the universal grinding machine is needed for reamers and arbors and other work. Drill-grinding machines for twist and four-lipped drills, a tool-grinding machine to grind all forged tools before they go to the workmen, save time.

This class of grinding machines is now sold at a figure that is within the reach of any shop. A cutter grinder to keep cutters and reamers in proper repair, and a hand lathe, will make a pretty complete outfit for the ordinary shop; but the most complete outfit will not make tools without proper direction.

The person in charge should be a man not only competent to make what is ordered, but one whom the heads of other departments may consult with in regard to methods and tools to use to advantage, that will enable them to produce the best results. A man who has devoted his whole time to tool-making is liable to have very little knowledge of machine building. The tool-room foreman should have a general knowledge of both tool-making and machine-building to make the tool room a success. For help in the tool room, I prefer the boy who has just finished his apprenticeship; after having become familiar with the use of the tools, he learns more readily how to make them than workmen from other shops, who have had more experience.

The attendant at the delivery window need not be a mechanic; it requires a person of intelligence who is capable of easily learning the names of the tools and the uses to which they are applied, so he will understand what is wanted by the applicant, who doesn't always know what he wants himself, as he may be a new man, not familiar with the tools at hand.

The New York Electric Hansom Cabs.

BY HUGH DOLNAR.

While the American mechanical public at large is viewing the horseless carriage as a dream of the dreamers, a regular service of twelve such carriages has been established in New York, under commercial conditions of competition with horse-drawn vehicles, by the Morris & Salom Electric Carriage Company of Philadelphia.

This is a significant state of affairs. The motocycle is still a novelty, which fact might easily cause demand enough to keep two or three manufactories of moderate size full of orders without very much actual commercial or paying use of the vehicles themselves.

The Morris-Salom venture is of a different class. The electric hansoms, offered for public use only since March 15th of this year, are meeting with public favor to the extent it is claimed of paying current expenses and leaving an actual profit, the rates of hire being the same as those of horse-drawn hansom cabs in York City. So far as the writer is now informed this is the first attempt to make this important demonstration.

The hansom cab, the construction of the motors by which the motocycles are driven, and the charging bench and battery-cart used in charging and handling the batteries, are shown in the engravings herewith.

Mr. Salom, the electrical engineer under whose direction these carriages have been constructed has been long connected with storage battery development, and is confident of great future storage battery use, both in the motocycle and for street railway car propulsion. However this may be, it is certain that in points of cleanliness and convenience nothing can excel the storage battery for motocycle driving.

Mechanically the electric hansom is a very low carriage, having large driving wheels in front, and small trailing steering wheels in the rear. This gives a low centre of gravity, and carries the storage batteries at a convenient hight for handling them in and out of the vehicle, and gives the driver a seat above the batteries at a suitable elevation for observation. By placing the large driving wheels in advance, the smaller trailing wheels are easily pulled over obstacles which would stop the carriage if small wheels were pushed against them. This general arrangement of parts is very creditable and was lately held sufficiently deserving by the Franklin Institute of Philadelphia to receive the John Scott medal.

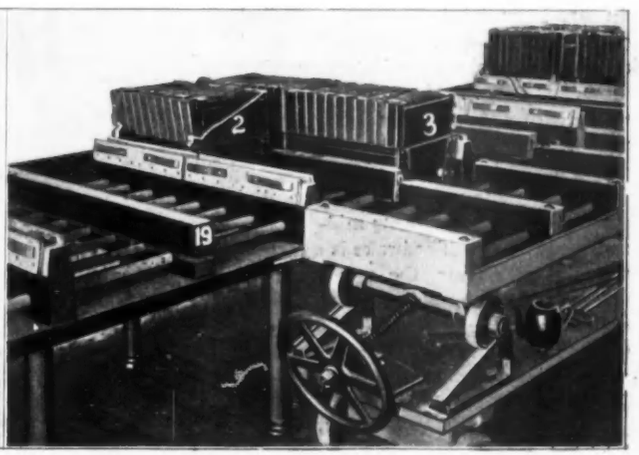
The wheels are of bicycle construction, carried on roller-bearings in front and on ball-bearings with 3-16-inch balls in the rear. The tires are pneumatic, inflated to 80 pounds pressure, which gives about 6 or 8 inches flat bearing on the pavement. The batteries weigh about 1,000 pounds per carriage, and require about 8 hours for proper charging. The total weight of the electric hansom with its batteries is about 2,500 pounds. Two sets of batteries are furnished for each vehicle.

The time required for changing batteries is only a few minutes, the batteries being withdrawn from doors in the rear directly on to the battery cart, and so readily conveyed to the charging bench, the floor of the battery compartment of the cab, the battery-cart and the top of the charging bench being all one hight and composed of moderately hard rubber rollers carried on steel rods. The battery-cart has a 4-wedge and hand-screw vertical adjustment by which its roller-bed top can be adjusted to suit the small variations in hight caused by the unloading of the pneumatic tires when the battery sections are removed, all as will be readily understood from the engravings. The charging bench is a structure of wooden lengthwise rails, carried on iron pipe posts, and having wooden cross-bars which take the ends of the rods on which the rubber rollers turn. These cross-bars are placed the width of the battery trays apart, and each alternate cross-bar is supplied with heavy spring brass charging contacts, supported on slate insulation slabs, all as plainly shown. An earthenware teapot seen on the bottom part of the carriage contains acid, and the long iron hand-hooks shown just beyond the teapot are used in drawing the batteries out of the battery chamber in the cabs. By means of these rubber-roller supporting surfaces and the battery-cart, the battery sections are easily handled by one man. The batteries are each in four sections or trays, each tray carrying four 3-plate elements so divided as to render series parallel control possible; the batteries are of chloride construction. The ordinary 110-volt current is used for charging, and the cabs will run about 24 miles on the level without changing batteries.

Two motors are used for each cab, the motors being secured directly to the stationary front wheel axle, and the motion being reduced about ten to one with spur-gear pinions on the motor shafts and rings of internal spur-gear secured to the front wheels which run loose on the axle. This gives each wheel an independent drive, and obviates the necessity of a compensating or "Jack in the box" gear for proper wheel action when the vehicle turns a curve.

With this construction it is obvious that all changes in carriage speed involve like changes in motor speed. In common with other motors of this class, the Lundell motor is less efficient at speeds below the normal, but it has peculiarities of construction which permit it to treble or quadruple its torque for a few seconds; so that at a very slow carriage speed the motor can give out a large amount of power in an emergency. The motors weigh about 150 pounds each, and each is rated at about 1½ horse-power at normal speed. The motors are series wound, and the employment of two motors permits the use of the series parallel control for changing speed. For change of direction the current is reversed, the whole driving

ELECTRIC HANSOM CAB.



CHARGING BENCH AND BATTERY CART.

machine being thus of the simplest and most direct description.

The principal changes made in the regular Lundell motor to adapt it to the cab service consist in changing the case to suit its condition of support by the front axle, and the substitution of roller bearings for the self-oiling bronze bearings employed in the stationary motors. The cab motor bearings are made very nearly or wholly dust-proof by the devices shown in the engraving, which will need no explanation. This section of the electric cab motor is worthy of study, as it is the result of much experiment, and presents a practical solution of the problems connected with running a high-speed motor in a cloud of dust and grit. The cab motors are, of course, a leading factor in the success of the vehicle.

The front wheels carry about two-thirds of the loaded weight of the vehicle, thus making it easy to steer with the rear wheels.

In Fig. 1 the driver is seen with his right hand grasping the spade-handled vertical steering lever, while his left hand takes hold of the short vertical controlling and reversing lever. If the lever stands in the middle of its arc of travel, the current is off, and the carriage stands still. If the lever is moved forward of the middle point the carriage moves forward, and if it is moved to the rear of its mid-position the carriage backs. The brake is operated through a foot lever, the upper end of which projects a short distance above the floor on which the driver's feet rest, convenient to his right foot. The brake itself consists of two concave-face, soft-rubber rollers, supported at the end of the brake-shaft rocker-arm in close contiguity to fixed friction surfaces, so that when these rolls are brought into forcible contact with the rubber wheel-tires, the rollers are revolved in contact with the fixed friction surfaces before mentioned. This makes a simple and efficient brake, capable of holding the carriage on any grade or stopping it within a few feet on the level.

The same company is considering the establishment of Electric cab stations in Washington and Chicago, its policy being not to sell vehicles, but to establish stations in various cities and look to rentals for returns.

The cab rate is much higher in New York than in any European city, being $1 for the first two miles, and 50 cents a mile thereafter. Whether the electric hansom would pay under much lower rates is not now known.

▲ ▲ ▲

It is announced that the Pennsylvania Tube Works have received the contract for 100 miles of 12-inch lap-welded steel pipe and 300 miles of 30-inch riveted steel pipe. The weight will be about 20,000 tons, and the order is said to be the largest ever made at one time. The pipes are to carry water to the Coolgardie mines, Australia.

Letters from Practical Men.

Rig for Slotting Links.

Editor American Machinist:

In your issue of January 28th, I was pleased to see illustrations, and a description of the arrangement used in one of your noted locomotive shops, for slotting reversing links, and again, February 25th, I noticed a sketch and description of a jury rig, for a similar purpose. Although a subscriber to all the best English papers treating on mechanical matters, I have invariably given preference to your esteemed paper, for the illustrations and descriptions of machine and other tools contained therein, together with many other important subjects, which are the outcome of sound reason and uncommon sense. This being so, and quite recently being interested in the above work, I naturally concentrated my attention on the above articles. I may say, I was somewhat surprised at the crude arrangement adopted by the Rogers Locomotive Works, as one would naturally expect something novel and worthy of note, coming as it did, from such an eminent establishment. The apparatus appears to me to occupy an undue amount of territory, and the introduction of the carpenter's trestle to support the outer end, tends to give it a scattered and foreign appearance to the slotting machine.

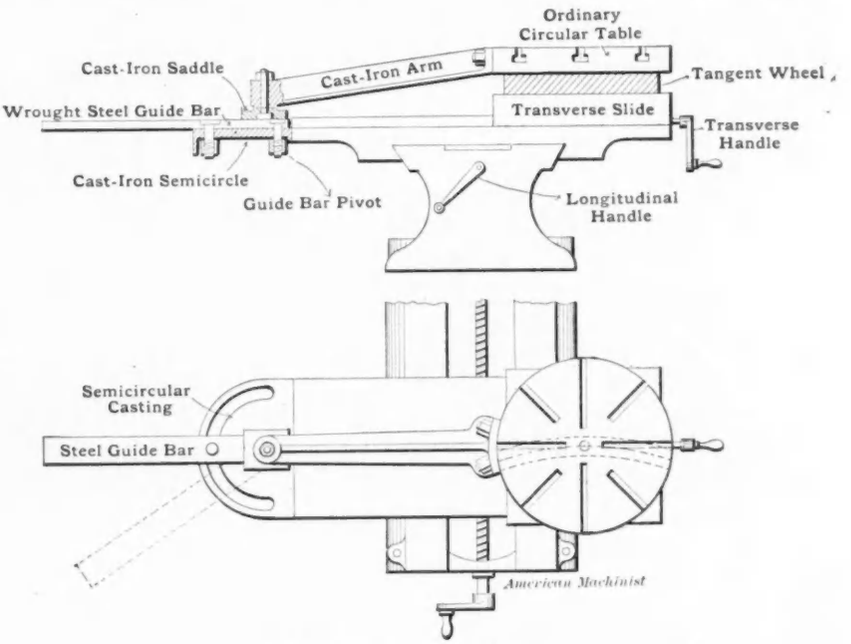
The jury rig referred to, is perhaps, not open to so much criticism, as it was evidently rigged up suddenly, and probably took less time to fix up than the other did to design.

About 18 months since, I was placed temporarily in charge of a general engineering shop in this city, where various standard sizes of winding engines were made. Up to the time of my taking charge, all the links were slotted after being roughed out by hand feeding, by means of a similar arrangement to that shown in the Rogers Locomotive Shops, but not nearly so well made.

Shortly afterwards we received an order for a pair of winding engines, much larger than any we had previously made; the links had to be slotted to a 9 foot 6 inch radius, and their length exceeded the travel of the slides of this particular slotting machine; consequently a larger machine had to be equipped for the job.

With this object in view, I was surveying the surroundings of the most suitable machine—which, by the way, presented many difficulties—when a young machinist, formerly from England, came along and offered a description of a rig he had seen in England for the purpose, and which I gladly accepted.

From his description, I made dimensioned sketches and got the necessary castings and forgings to suit the larger machine, and they answered perfectly; so much so that the manager instructed me to get a set out for each of the slotting machines. The following sketches will serve to illustrate the rig attached to an ordinary slotting machine, and I present it with the hope that it will prove of interest and service to some of your many readers.



RIG FOR SLOTTING LINKS.

As shown, the rig consists of four parts, viz.: the wrought-steel guide bar, which is arranged to sweep round on the upper surface of the semicircular plate, and be fixed at any required angle, as indicated by the curved slot and dotted lines representing the bar in another position; the cast-iron semicircle which is secured to the left-hand side of the longitudinal slide, and provided with a pivot pin for end of bar and a curved slot to fix the bar

at any angle; the cast-iron arm connecting the periphery of the circular table with small cast-iron saddle, the latter being pivoted to the end of arm, and machined to nicely fit and embrace both edges of the steel bar.

When in operation, the circular feed screw is removed, which allows the circular table to revolve freely on its center. The necessary curvature is obtained by the transverse feed and angular set of bar combined. Our largest machine, with a transverse travel of 36 inches, will, with the above rig, slot any true curve from a straight line down to 16 inches radius; anything smaller can, of course, be done by the ordinary circular feed, thus showing its great range of application. When properly made it looks part of the machine, and when not in use, it is only necessary to remove the cast-iron arm, when the bar can be swung round out of the way.

Our works manager, whose experience extends over forty years, both here and in England, pronounces it as being the best rig he has seen, and although we have workmen from all parts of the world, not one of us ever saw it before, with the exception of the one referred to. I therefore submit it as being uncommon, and only regret that I cannot lay claim to originality.

W. VALDEMAR DAM.

Melbourne, Australia.

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Making Small Rope Sheaves.

Editor American Machinist:

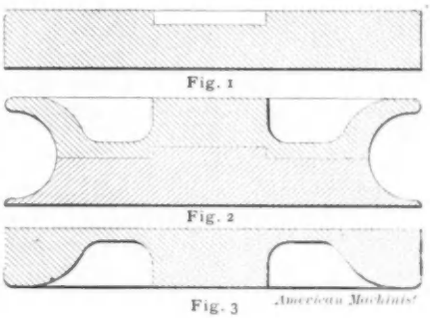
Some time since an order came into the shop for several hundred rope sheaves about 7 inches in diameter and 2 inches thick. As there were so many of them, I thought it worth while to spend some time studying on a way to make them so that we could get good clean castings, and at the same time make something on them. This will describe my way of making the pattern and how it was molded. I first selected a flask that four of the sheaves would go into comfortably, making a good smooth board for this of even thickness, with battens on the ends to keep it straight and with holes in it to match pins on the flasks. I next sawed out three pieces for each sheave of the required diameter and thickness. Putting one of these on the screw chuck of the lathe I turned it, as shown in Fig. 1. Taking this off and putting another (Fig. 2) on, I turned it with a boss to match the depression in No. 1. Now, chucking No. 1 on No. 2, I turn them both up together, as shown at Fig. 2, of course using templates where required. After this I turn up No. 3, as at Fig. 3. When all four patterns are turned in this way I lay them out on each side of my board, letting in No. 3 on the cope side down to the line of parting. No. 2 I fasten on the other side, being particular, of course, to get them just opposite.

No. 1 is loose and simply held in place by the boss.

The patterns when done look as at Fig. 4.

When ready for starting the mold, the first thing to do is to lay the cope down, the pin side up; putting the board on these I now have a frame made just deep enough to come to the parting line, and with the sides flared to form the bevel parting around the outside of sheaves. This frame is just the size of the flasks and has pin holes to match them. The pins, of course, are long enough to come clear through the board and steady this. The parting between the sheaves is made straight from one to another, and has to be made with the trowel.

After making this parting the drag is put on, rammed up and lifted off, and No. 1 part of pattern taken out; the drag is then set back and rolled over. After this



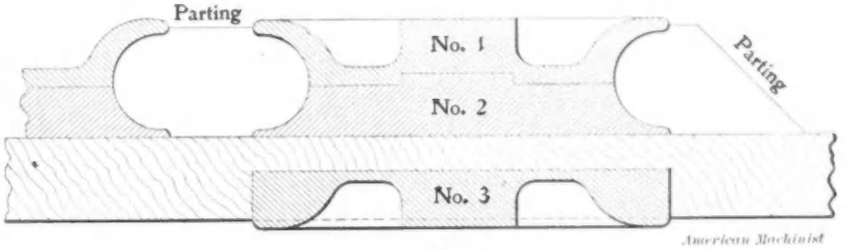


Fig. 4

MOLDING SMALL ROPE SHEAVES.

is done ram up cope, lift off and draw the rest of the patterns, board and all, then close. It will be seen that the flask is only rolled over once, and that there is only one parting to make by hand. There may be better ways of making such work as this, but this surely is a good way, and was new to me and this section of country at any rate.

I am a good deal of a believer in boards like this for a variety of work; and if the patternmaker will use a little ingenuity he will be surprised at the number of things that can be molded this way to advantage. A few days ago I looked in at the cleaning room and saw a pile of car brake wheels that I made the pattern for about two years ago. There were probably fifty wheels in the pile, and I do not believe there was one that needed to be chipped or ground in the least except at the gate, and there very little, as they were set gates and broke very clean and all alike.

I had forgotten to say that on the sheaves I put gates on the board running to the rims of the sheaves. Then I nicked them a little straight across and they broke nicely, never taking a piece of the rim with them as a gate cut by the molder is pretty sure to do sometimes. The four sheaves were all poured at the one time and there was only one gate pin to set for them all. The brake wheels that I speak of had a one inch square hole in the center. To get this I let in on the drag side a round piece in halves to the depth of the whole hub and with taper enough so that it would be sure to stay down when the board was lifted. In this I cut the square holes so that it parted at the corners. After the board was lifted it was an easy matter to take this off leaving a perfect green sand on that was sure to be in the middle on both sides, a thing that you can't be sure of with a dry sand or even with a top print with the class of molder that is usually put on this class of work.

C. H. ALLMOND.

Seattle, Wash.

▲ ▲ ▲

Machine Grinding.

Editor American Machinist:

I have read with interest the able articles of Mr. Norton on machine grinding. His treatment of the causes and the remedy for distortion of work in grinding is most interesting and instructive. There are some points about grinding, however, that Mr. Norton has failed to touch upon or has touched too lightly to entitle his articles to be termed comprehensive in the fullest sense. From a wide experience in the grinding department of the Brown & Sharpe Mfg. Co., it would seem that a definite rule should have been formulated for the relative speed of the revolving work to the speed of the emery wheel, i. e., surface speed: For instance, if the emery wheel revolves at the rate of 5,000 surface feet per minute, what is the best speed for the work in feet per minute? The feed rate undoubtedly enters into this question somewhat, but it would seem that an approximate rule could be given as well as for a lathe or planer.

Again, I notice that Mr. Norton has not touched upon the subject of the diameter of the emery wheel except to give the size of the wheel used on the Brown & Sharpe universal grinders. There are, of course, other grinders using smaller wheels, and others using larger ones. Is

there not such a thing as having the work too large for the wheel? It is a common fallacy to try and speed up a small wheel to make it do the work of a larger one. Take, for example, a 12-inch wheel and suppose that in grinding a certain amount from a piece of work, we wore off a few millions of Mr. Norton's "particles," say two millions, which necessarily diminishes the diameter of the wheel a certain amount. Next take a 6-inch wheel of same width and grade and perform the same amount of work with it, running at the same periphery rate of speed. It is evident that under identical conditions the 6-inch wheel will wear away the same number of emery particles. If we assume that one layer of particles wore off the circumference of the 12-inch wheel, a little more than two layers must have been worn from the 6-inch wheel, and the diameter reduced in proportion. The question that the writer would like to hear discussed is, What is the ratio to be observed between diameter of wheel and diameter of work to obtain best results? Further, I should like to ask Mr. Norton to kindly express his ideas upon the subject of the clogging or filling up of the surface of emery wheels, which is a common trouble.

O. S. WALKER.

Worcester, Mass.

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Jig for Transverse Holes in Collars —Salesmen.

Editor American Machinist:

In your issue of February 18th was an article describing a jig for drilling transverse holes through collars. I wish to just show how I would recommend making a jig as above, cheaply and accurately. The conditions of business in these times demand, when work is to be duplicated, that jigs, fixtures and special tools be made. I regret to say that in many of our shops when such tools are made, they cost much more than they should, and for the reason that the best attention is not given by the manager, and the work gets into the hands of some expensive toolmaker (so called), who spends lots of time trying to do a good job. I will show in Fig. 1 a design of a jig for doing similar work as in above article, and also will try and explain how to make it. This jig should be made of crucible steel, and with hardened and ground bushings. First have the piece of steel planed up square, and place it on an angle iron, as per Fig. 2. Set the angle iron the correct distance from center, as indicated at *A*, then proceed to bore hole to dimension desired. Then, when ready to bore the bush hole, turn the jig or piece of steel one quarter turn on the angle iron, as shown in Fig. 3, and when clamped in position bore the bush or cross holes. Care must be taken to not move the angle plate, and also keep the same side or surface of the jig on angle iron, and the result will be that you have an almost perfect drilled jig. In boring the first hole the sides of the block must, of course, be square with the face-plate, and for the second hole they must be parallel with it.

SALESMEN.

We note with interest your talk with salesmen at the New York Cycle Show, in same issue. We hope the time will come when manufacturers will send to such shows and exhibitions men who are practical and understand mechanics. I shall never forget once listening to one of these polished talking machines explaining the good features about his lathe, at the Mechanics' Fair in Boston. The point he seemed to force was the accuracy of the lead screw in his big lathe, which was some 24 inches swing and perhaps 14-foot bed.

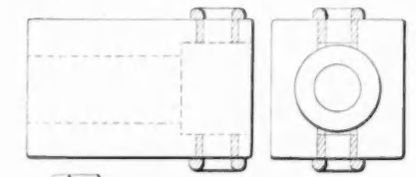

Fig. 1

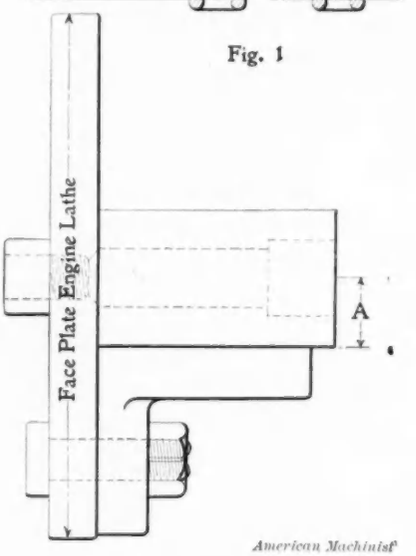

Fig. 2

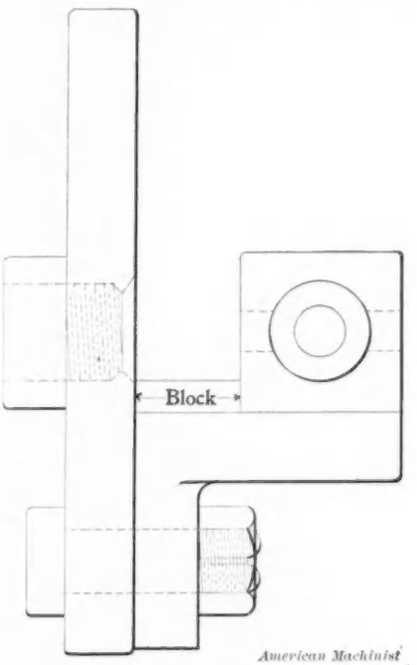

Fig. 3

JIG FOR HOLES IN COLLARS.

I asked him how much the screw was out in each foot. He promptly replied "not over five ten-thousandths of an inch." Most of us who have tried to make good screws know to our sorrow that it is a rather close job to make a screw as above represented, and I am sure if the salesman only understood what he was saying he never would have made any such remark. Years ago I placed in one of the largest and best shops in this country a lot of machinery for doing a certain job. The machinery was on approval and if not satisfactory to be returned. After starting same and I was ready to leave I reported to the superintendent. He said, "Well, what do you think, will these machines do the work?" I replied, "Yes, sir; but I wish they were a size larger." He pleasantly looked at me and said, "You are the only salesman that comes here that I can believe. I will keep these machines and pay for them promptly." It is a rather sad thing to say, however, I have salesmen come into my office every month who are slick, polished fellows and represent good houses who tell me, if I may use plain words, many lies and stories that will not bear close investigation. My kind advice to such fellows is to always tell the truth, and when asked a question that they do not understand to frankly admit that they do not know.

F. J. WOODHURST.

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Some Notes on Cast Iron.

Editor American Machinist:

The discussion of this subject appears to me to be so one-sided that its center of gravity is liable to fall without its base, a condition which always, if not intentional, causes trouble. Mr. C. O. Griffin, in your issue of March 18th, recommends its use without babbitt metal or other embellishments for the slides of Corliss engines, and backs his advocacy with living examples. Now, I do not wish to make any sweeping assertion, but there is no doubt in my mind that if Mr. Griffin were to travel all over the country he would not find, except in the prairie localities, an engineer who had not used wooden slides and found them A1 in all respects. I have met engineers who have used, and with comparative success, wooden crank-pin boxes. I want to add that these men were in no sense "wooden engineers," either. It is perfectly safe to say, however, that in the great majority of engines, the use of wood for any wearing part would not be a success; all of which goes to show that isolated cases ought not to be accepted as a criterion.

One reason why I should object to the use of cast iron for crosshead slides would be its liability to wear the guides faster than babbitt metal, to say nothing of the damage that would result in case the surfaces were to get dry. I cannot think that the difference in the cost between cast iron or babbitt for the amount required would in any case justify using cast iron alone. The slides are quickly re-babbitted; while to repair or renew the guides would be expensive. Locomotive practice, in order to secure light crossheads is to make them of steel, and then tin the surface that slides on the guide bars. This method reduces weight and number of pieces, and all that I see standing in the way of its use in stationary practice is, to adopt an adjustable guide bar.

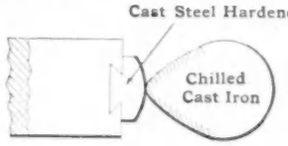

Fig. 1

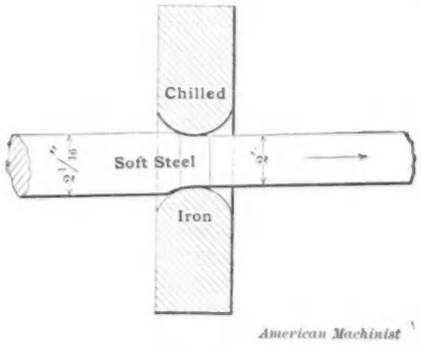

Fig. 2

CAST IRON WEARING SURFACES.

I would not have it understood that I wish to underestimate in any way the value of cast iron. There is no other metal that will take its place for toothed gearing. Its strength may be increased by converting it into steel or wrought iron at the expense of its wearing quality, and consequently increasing its frictional resistance. In many instances cast iron wears well on cast iron, and what adds to its value—it is not antagonistic to other metals. When the surface subject to wear admits of being chilled, it will slide under enormous pressure without wasting 10 per cent. in friction. As instances of this kind, take a cam shaft for a bolt machine, as shown in Fig. 1. When the cam part of the shaft is cast in a chill, the rubber is made of tool steel and hardened (the harder the better). Fig. 2 shows a die for making steel shafting, where a bar 2 1-16 inches is reduced to a 2-inch shaft by a very simple but severe process. It requires about 36,000 pounds pull to draw that size shaft. The reader may guess at the pressure between the die and the shaft. This last instance gave rise to a suspicion in my mind that a chilled iron box, having the concave surface ground and polished to fit the neck of a steel roll, would wear well. My impression was that the hard, smooth surface of the box would not permit any interlocking of fibers, but, on the other hand, the neck would be burnished. A single experiment, however, demonstrated the fact that it would be very difficult, if not impossible, to get a box both smooth and hard enough to prevent particles of the steel from adhering to the box. It may be possible that a very small part of the neck may get hot enough (both speed and pressure are high) to fuse with the box, although the neck is flooded with water.

J. H. DUNBAR.

Youngstown, O.

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Cross Hatching Without Special Instruments.

Editor American Machinist:

The simple and efficient device for cross hatching described by Professor L. F. Rondinella, in your issue of May 27th, has brought to mind a method I have used for several years, and which may be new to some of your readers. The great advantage is that no instruments are required excepting those which form a part of every draughtsman's outfit, namely, a small spring circle pen, a triangle and T-square. The needle-point is raised slightly above the point of the pen, and adjusted from it a distance equal to the space desired between adjacent lines. Thus arranged, the lines are drawn just as though an ordinary ruling pen was being used. Each time the triangle is moved until the needle point comes directly over the line previously drawn. By adjusting the distance between the points any desired fineness of hatching may be obtained, and parallel lines up to an inch apart may be accurately spaced.

I know of several cases where young draftsmen have cross hatched neatly from the first by use of this method.

W. S. V., Jr.

[The above suggestion is certainly well deserving of reproduction; but it will doubtless occur to many of our readers that the practice must be very tiring for the eyes, which objection most of the devices are designed to avoid.—Ed.]

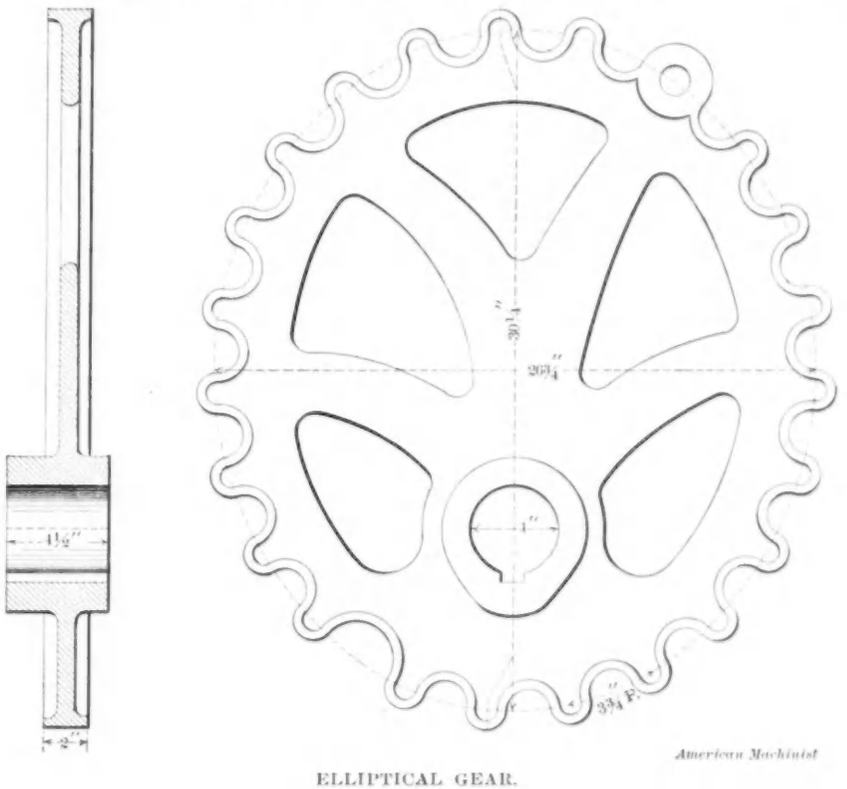
▲ ▲ ▲

A Cast Elliptical Gear.

Editor American Machinist:

I send you a drawing of an elliptical gear we are using on a power hay press, which I think more practical than the one described by Mr. Frank Richards in your issue of April 22d. I suppose our friend Grant will criticize the form of teeth; but for heavy work and slow speed, with cast gears, they work admirably.

This gear works smoothly and has a very heavy pressure to withstand. We struck the pitch line with a trammel, and, with the exception of the large tooth and space, we spaced the teeth on the pitch line the same as we would for any other gear, allowing the same clearance, and worked teeth on pattern by hand as accurately as possible.



ELLIPTICAL GEAR.

EZRA ESTEP.

Sandwich, Ill.

[The large tooth is an eye for a pin which carries a connecting-rod or "pitman."—Ed.]

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Name and address must always be given, though not necessarily published.

Communications for or relating to the reading columns should be addressed to the Editor. All business communications should be addressed to the Company.

Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once. Date on wrapper denotes week with which subscription expires.

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How Inventions Are "Wanted."

Appreciation seldom anticipates the realization. We are still children, in so far at least that we do not know what we want until our want is satisfied. Inventions to fill long-felt wants, however glibly they may be talked about, are very rare in fact. In the world's history all of the most necessary things of to-day have been successively not wanted. The world once lived well enough without them, but to-day their annihilation would mean death and despair for us.

Many in these days, workmen and employers alike, are disposed to look askance at new labor-saving devices as overdoing the matter, or as being too much of a good thing. When the windmill or the watermill first began to grind the corn, we may be sure that there were kickers. Guttenburg had to cut his first types in close imitation of the famous copyist, the monk Godefalcus, and Faust in Amsterdam had to declare that the copies of the Bible which he offered for sale were written by hand. The power loom was going to bring starvation and ruin, and little else. The Monitor had to fight the Merrimac as the property of private citizens; it, too, was not wanted.

"The Engineer," London, in the light of its late unsatisfactory experience with the autocar, is asking whether or not it is really wanted, and is quite disposed to give the question a negative answer. While this is the present conviction of the best information and the best authority in the world upon this interesting subject, it need not in the least discourage—as it probably will not discourage or hinder—any inventor with the true inventor's instinct and impetus, from going right along to the accomplishment of his self-imposed task. The true answer to the question as to whether or not the world wants the autocar is probably that it does and it does not. It seems to be quite clear that the world does not want the present car, as far as it has been revealed. The world is well satisfied with the horse. It has an affection for the horse that it can never have for any mere machine. The horse is second only to the human form divine in the spectacular and the picturesque. The horse is in no danger of being supplanted except by an abler and a better servant, and this the autocar must prove itself before it comes to be wanted.

The objections to the present autocar, distributed through the various examples of it, all the objections residing in no single machine, but some of them being found in each, are, all together, too numerous to mention, and many of them are fatal. They cost too much, or they are too heavy, or they are noisy, or they have an unpleasant jar, or a bad smell, or they will not run satisfactorily at different speeds and with different loads, or they are only good for the smoothest roads, or they cannot climb hills, or they cannot run far enough without giving out, or they require too much attention and special and trained skill to operate.

It is not a difficult thing to imagine an autocar without any of these objectionable features, and it can scarcely be denied that we are steadily approaching it. Something cheap, handy, always ready, and which anyone can use without anxiety or discomfort, would certainly make its way into common use, and only after its general and complete adoption would it be safe to say that it was wanted. That it will not in this way eventually be wanted we have not the hardihood to suggest.

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The Straight Line.

It would doubtless be a good thing for us all if we kept a little nearer to, or if we maintained a more familiar acquaintance with first principles. The first principles, as we glibly call them, are perhaps misnamed. They are not first principles simply because they are first learned, but because they are of the first importance. They are no more useless and no more to be discarded when we get farther along than are the first stones of a building decreasingly useful as it rises higher and higher. Our dependence upon first principles augments rather than diminishes continually. The young mechanic, and even he that is not so young, too often seems to think that the further along he gets in his art, craft or trade the farther he must necessarily get away from these first principles. There was a never a bigger mistake. We are early enough taught that the straight line measures the shortest distance between two points, and in that direction lies evermore the promised land; but we soon forget it. We get in love with curves and crooks, and go wandering in the wilderness of ingenuity, and only a few ever get back to the old straight road. If we do ever return, it is when common sense asserts itself. The supreme human sense is common sense. Common-sense work is always straight-line work. Whether adopted at the outset or accepted when all else has failed, it is always the sure winner. Common sense, besides its rectilinear rapidity, if not by reason of it, is also more widely applicable than any other. It can be employed everywhere, and the wonder is that its use is not universal. So of the straight line. We are ready to believe that we have done something to promote the appreciation and the employment of it in machine design and construction, and we hope to see it still go on its all-conquering course. In the doing of whatever is to be done, it is equally applicable. In the devising of means and methods the straight line is always the best connecting rod between cause and effect. In seeking information, the direct, straight communication with the source will secure the fullest flow. In the imparting of knowledge the laying out of winding and picturesque channels may be a fascinating employment, but they dissipate the force and volume transmitted. In all our intercourse, in all our schemes for helping things along, the straight line is never to be forgotten. All misunderstandings disappear in the process of straightening out, and the straight line is at once the symbol of good workmanship and of good fellowship.

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Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer questions by mail.

(104) Old Subscriber asks: What is the proper method in backing off reamers after being tempered? Some claim that the reamer should be revolved backwards while the emery wheel runs the other way, while others claim that the fluted reamer should be held with a ratchet, and slid to

and fro while the wheel is in motion. A.—It is not so easy to say what is the proper and absolutely correct way of doing a thing as to say what is the usual and accepted practice. Reamers are ground one tooth at a time, the face of the tooth resting against a thin spring rest, and the reamer, mounted on centers, being moved back and forth longitudinally before the edge of the revolving wheel.

(105) S. E. B., New Brunswick, N. J., asks: 1. What is the meaning of the term "staggered teeth," as applied to gears? A.—It means that the gear is composed practically of two gears placed side by side and bolted together so as to make in effect one, but with the teeth of one-half standing opposite the spaces of the other. 2. Are the rules used for determining the speeds and sizes of pulleys applicable to friction gears? A.—So far as the speed is concerned, the rules are the same; but the friction gears will carry only about one-half the power of belted pulleys of the same width, size and speed—the pulleys being made of paper and iron in the usual way. See our issue for January 28th last, which reproduces a paper by Professor Goss on this subject, read before the December, 1896, meeting of the A. S. M. E.

(106) H. C. W., Camden, N. J., writes: I have a chain of wrought iron, 2½ inches diameter, that I run over a wheel with five pockets into which the chain fits. The very heavy strain on the chain wears the shoulders of the pockets rapidly, tending to let the chain slip through. Would there be any objection to a cast-steel wheel? Would the steel wear more slowly than cast iron, or would it be likely to damage the chain? A.—It would probably be well to use the cast-steel wheel. Steel gears certainly last much longer than cast-iron gears, under the same conditions. If the chain links wore, it would necessarily be slower than the wheel, as the wear would be distributed over many more links as compared with the five shoulders in the wheel. It might be well, if possible, to change ends with the chain when putting in the new wheel to get unworn bearing surfaces to begin with.

(107) D., Summit, Ill., has in his charge a machine in which two shafts are geared together and work under a heavy load, the speed varying from ten to sixty revolutions per minute. The load is so heavy that it forces out the babbitt, and he wishes to know if he cannot pour the box with brass instead of babbitt. He asks: 1. Do you think this can de done? A.—Yes. 2. Can I get heat enough in a portable hand forge to melt the brass in a crucible? A.—Yes. 3. Do you think the shrinkage will be so great as to pull bushing loose if casting is first well heated? A.—If, as we infer, you intend to cast a solid ring around the shaft you will find it difficult to do unless you can stretch the ring by hammering on the outside. 4. Will the brass lie close to the shaft? A.—Yes, if the shaft is heated sufficiently—the hotter the better. 5. What is a proper "dope" to use on shaft? A.—There is nothing better than heat. 6. What mixture is suitable, and how should it be melted? A.—The composition known as U. S. Government metal is good; it is composed of copper, 88 parts; tin, 10 parts; zinc, 2 parts. Melt the copper first, add the tin, and lastly the zinc. When ready to pour throw in about one inch in length of stick phosphorous and stir the mixture, which will be made very liquid by the phosphorous. You do not say how much space you have to fill. The larger this is, the better your chances of success, and this space should be, as nearly as possible, equal all around. Have you ever tried genuine babbitt, composed of tin, 96 parts; antimony, 8 parts; copper, 4 parts? You would have less difficulty in pouring this than the harder metal. Our information is obtained from Mr. G. B. Seddon, of the Freeland Tool Works, who pours brass in this way quite extensively.

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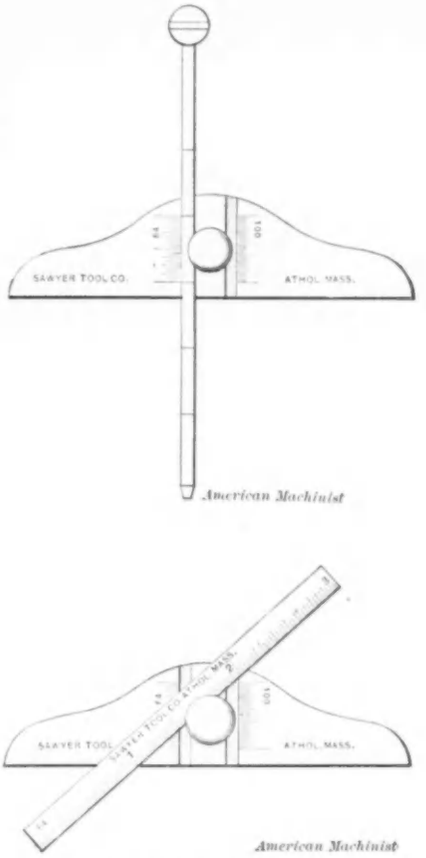
Depth and Bevel Gage.

We illustrate herewith a new depth and bevel gage recently brought out by the Sawyer Tool Company, of Athol, Mass. It will be seen that the gage employs a small rod, making it suitable for gaging the depth of small holes. This rod is divided into half inches by rings cut into it, the finer divisions being read from the scale engraved upon the head. The rod is let into the head to one-half its depth, so that the dimensions are easily read from the ring marks. Two scales are provided, one divided into sixty-fourths, and the other into hundredths. The button which holds the rod is also adapted to hold a grauated scale, thereby converting the instrument into a bevel gage.



DEPTH AND BEVEL GAGE.

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Standard Blueprint Tables.

A good service is being done for machine draftsmen and designers and shop men in general in getting into handy form for every day use some of the familiar tables of dimensions, and other matters which are approximately standardized, and representative of the best established practice. They are blueprint sheets, about 11 x 8 inches, and fifty are already issued or soon to appear. The table of Standard Stuffing Boxes shown herewith is one of the series. It is Seaton's table in Whitham's "Steam Engine Design." The blueprints are made by Robt. Fortune, 267 24th Street, Detroit, Mich.

A	B	C	D	E	F	G	H		J	K	L	P
	Gland Brass.						Iron.	Brass.				
¾	....	1⅜	1 5/16	5/16	⅜	⅞	...	⅜	½	1¾	1	2¼
⅞	....	1½	1¾	5/16	7/16	1	...	⅜	½	1 7/8	1	2⅜
1	....	1⅝	2	5/16	7/16	1⅛	...	⅜	5/8	2	1⅛	2⅝
1⅛	....	1¾	2¼	5/16	7/16	1¼	...	⅜	5/8	2⅛	1⅛	2¾
1¼	....	2	2⅜	¼	1	1⅜	...	⅜	5/8	2⅜	1¼	3⅛
1⅜	....	2⅛	2½	¼	1⅛	1⅜	..	⅜	5/8	2½	1¼	3¼
1½	1¾	2¼	2¾	¼	1¼	1½	5/8	5/8	5/8	2¾	1¼	3⅜
1¾	2 1/16	2⅝	2 7/8	5/16	1 5/16	1⅝	⅝	⅝	¾	3⅛	1½	4
2	2⅜	3	3⅛	⅜	1⅜	1⅝	¾	½	¾	3⅜	1½	4½
2¼	2⅝	3¼	3¼	⅜	1½	1¾	¾	½	⅞	3⅞	1¾	5
2½	2⅞	3½	3¾	⅜	1⅝	1⅞	⅞	⅝	⅞	4⅛	1¾	5¼
2¾	3⅛	3¾	3½	½	1¾	1⅞	⅞	...	⅞	4½	1¾	5½
3	3½	4¼	3½	½	1¾	2	⅞	...	⅞	5	1¾	5¾
3¼	3¾	4½	3¾	½	1¾	2	⅞	...	⅞	5¼	1¾	6
3½	4	5	4	½	2	2	1	...	1	6	2	6⅞
3¾	4¼	5¼	4¼	½	2	2⅛	1	...	1	6¼	Round	7⅛
4	4½	5½	4¼	½	2	2⅛	1	...	1	9½	....	7½
4¼	4¾	5¾	4½	½	2	2⅛	1	...	1	9¾	...	7¾
4½	5	6	4¾	½	2	2¼	1⅛	...	1	10	...	8
4¾	5¼	6⅛	4¾	½	2	2¼	1⅛	...	1	10¼	....	8½
5	5⅜	6¾	5	⅝	2¼	2¼	1⅛	...	1⅛	11¼	....	9
5⅛	6⅛	7½	5	⅝	2¾	2⅜	1⅛	...	1⅛	12	....	9¾
6	6⅞	8	5	¾	2¾	2⅜	1¼	...	1⅛	12½	....	10¼
6½	7⅛	8½	5¼	¾	2¼	2½	1¼	...	1⅛	13	...	10¾
7	7⅝	9¼	5¼	¾	2½	2½	1¼	...	1¼	14¼	....	11¾
7½	8⅛	9¾	5¼	⅞	2½	2½	1¾	...	1¼	14¾	....	12¼
8	8¾	10¼	5½	⅞	2¾	2½	1¾	...	1¼	15¼	....	12¾
8½	9¼	11	5½	⅞	2¾	2½	1⅞	...	1¼	16	....	13½
9	9¾	11½	5½	1	2¾	2½	1⅞	...	1⅞	16¾	....	14
9½	10¾	12	6	1	3	2¾	1⅞	...	1⅞	17¼	.	14½

On Monday, July 19th, at the New Criminal Court Building, New York, examinations for Assistant Draftsman, Board of Education, and Junior Assistant Draftsman, Board of Examination, will be held. Applications may be obtained by addressing S. William Briscoe, secretary, New Criminal Court Building, New York City.

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In these hot-weather days reduce the friction as much as possible, and wear loose collars with easy clamping devices.

Commercial Review.

NEW YORK, Friday Evening, July 2.

THE ENGINE MARKET.

The aspect of business in steam-power machinery is such as to inspire, not indeed full confidence, but yet a fair degree of hope. There are several reports of June trade which sound very well indeed. They do not consist merely in anticipations, but are emphasized by good sales of engines, boilers, etc. Yet they are hardly numerous enough to be fairly characteristic of the market. The question is, whether they are mere sporadic phenomena, as such reports have proved in the past, or signs of the dawning of an actual day of trade revival. Even in some quarters where sales have not been large, a better undertone is manifest, and if business is really going to improve, it seems that the engine industry will not be the last to respond to the upward impulse. One circumstance not altogether favorable must, however, be admitted, and that is, the exceedingly sharp cutting of prices in boilers and engines, both high speed and of the Corliss type, which now exists. If we are really about to see the beginning of a business revival, the present time may stand in the future as that of the historic low-water mark in engine prices.

WHAT HAS ACTUALLY BEEN DONE.

During the month of June the Central London Underground Railroad ordered six 1,000 horse-power Allis-Corliss engines for its new electrical equipment, and the Government Tramways at Sydney, Australia, bought four of the same power. Three of the same size and make have recently been contracted for by the Metropolis West Side Elevated Railroad, of Chicago, and a still larger one for the Sagamo textile mills, at Fall River, Mass.; two smaller ones for the Government printing office at Washington, and a large blowing engine by the Carnegie Company. From these orders it may be inferred, what is otherwise apparent, that street railways constitute a factor in the engine market more important than almost any other. In this line was a June order for a Russell engine to be used in connection with a Westinghouse dynamo upon the Waulkill Valley Railway, which is to cross the Hudson River bridge at Poughkeepsie, N. Y. Cotton mills in the South are also spoken of by one company as a noteworthy source of present demand.

A remarkably heavy business was done by the Lidgerwood Manufacturing Company last week, aggregating thirty hoisting engines. The Weston Engine Company received orders for six engines on a single day of the present week. Three of them were for Fort Wayne, Ind., two for Boston and one for Cincinnati. They

(Continued on page 35.)

Business Specials.

Gear wheels, gear cutting. Grant; see page 16.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Engine Castings ⅛ to 2 H. P. Finished boilers and engines. Grant Sipp, Paterson, N. J.

Standards—See adv. AM. MACH. June 24 Send 3c. First five sheets. R. Fortune, 267 24 St., Detroit, M.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y.

Gear and milling cutters, adjust. reamers, counterbars and tools, vert. millers, drill pr., cutter and surf. grind., shears. R. M. Clough, New Haven, Ct.

Cost of Manufacturing—Experienced manage will establish system of costs, giving exact account of every detail. Charge based on saving effected. Correspondence solicited. Geo. C. Thomas, 99 Nassau Street, New York, Room 212.

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Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than Saturday Morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Situations Wanted.

Mech. draftsman, 3½ years office, 4 years shop; auto. and gen. mach. Box 59, AMER. MACHINIST.

Wanted—Situation as foreman of a machine shop; reference first class. Box 87, AM. MACHINIST.

Wanted—Travelling position, mch. tools, machinists' supplies or steel. Box 77, AMER. MACHINIST.

Designer and draftsman, printing presses, folders, printers' special machinery; effective worker; open Aug. 1. Box 84, AMERICAN MACHINIST.

Wanted—Posi. by young man as traveling salesman, machinery line pref., 3 years' exp. on the road and 7 years in machine shop. Ad. Box 82, AM. MACH.

Wanted—Situation by experienced foundry foreman; up-to-date and progressive in modern foundry practice; results assured; no experiment; references. Box 75, AMERICAN MACHINIST.

Europe—M. E. and E. E. and prac. mach., speaks Eng., German, French, would travel Europe for tool mach'y as representative or expert. 20 years experience. Best references. Box 73, AM. MACH.

Change wanted about the first of September by successful supt. with 20 years' experience on wide range of work. Member A. S. M. E. Gold plate references. Address Box 69, AMERICAN MACHINIST.

Pos. as supt. or assistant supt. by up-to-date, progressive young man, tech. graduate, exp. in mod. shop methods, also draughting; strictly temperate; good ref.; member A. S. M. E. Box 86, AMER. MACH.

Help Wanted.

Wanted—A first-class machinist, one who understands automatic machinery. Apply 30 Tenth Ave.

Wanted—Mech. draftsman, thoroughly familiar with bicycle designing. State experience, salary expected, etc. Address Box F, Station O, Chicago, Ill.

Wanted—Experienced machine room foreman, high grade bicycle work, about 100 men. None but experienced men need apply. References required. Address Stoddard Mfg. Co., Dayton, Ohio.

Wanted—An all-around mechanical draftsman; wages moderate; permanent position to the right man. Address, with experience, references and wages expected, Drawer No. 22, Hartford, Conn.

Wanted—A first-class, sober and reliable machinist blacksmith in small country town, one hour distant from New York. Also an experienced brass polisher. Address Box 81, AMERICAN MACHINIST.

Wanted—Supt. for bicycle plant, capacity 10,000 to 15,000 machines. Must be a thoroughly competent draughtsman, tool maker, machinist, and must understand the complete mfr. of bicycles. A man fully equipped can secure a per. and good paying pos. Address, with ref., Box 83, care AM. MACH.

Foremen, tool-makers, machinists, salesmen of exceptional ability, wanted at large English cycle works making everything including castings, tubing, etc.; reply giving qualification, experience, age, length of engagement and salary required; personal interview can be arranged. Ad. Box 85, AM. MACH.

Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d h'd lathes & planers. S. M. York, Clev'd, O.

Calipers & Gauges. F. A. Welles, Milwaukee, Wis.

The Dutton Wet Twist Drill Grinder is sold by the Garvin Machine Co., New York City.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Wanted—Iron planer, second hand, about 28" x 28" x 6'; state prices. H. L. McCullough, Cropsey, Ill.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Boye, Cincinnati, O.

"Modern Steam Engine Construction," parts 1 to 10; 30 cents each. T. F. Scheffler, Erie, Pa.

Models and experimental work, special machinery, dies, tools, specialties. Welch & Hutchinson, 87-91 Pearl Street, Brooklyn, N. Y.

We make a specialty of Shartle's patent safety set collars. Prices low and samples free. Middletown Machine Co., Middletown, Ohio.

Patent Office practice, correspondence course of instruction for inventors and draftsmen. Address H. F. Noyes, 56 Liberty Street, New York.

Lathes, planers, drills, milling machines, vises, also brass working machinery second-hand; must be modern, cheap and in first-class condition. C. C. Wormer Machinery Co., Detroit, Mich.

For Sale—Machine shop, with fine tools, milling machine, lathes, drills, etc.; doing a good business; best of reasons for selling. A good bargain for $3,500. Address Box 71, AMERICAN MACHINIST.

For Rent—A machine shop in connection with our factory; traveling crane and all conveniences; power, heat and light supplied; railroad siding; rent may be paid in work. Address Delaware Hard Fibre Co., Wilmington, Del.

A well established firm in Central Germany desires the agencies for Germany and Switzerland of well known mfrs. of lathes and machine tools of every description. Large space for warehousing at disposal. Highest ref. Address Box 67, AM. MACH.

Wanted Capital, $10,000—A one-half interest in an established machine tool company is offered a practical man having the executive ability to conduct the business. Strictly modern shop and equipment with ample orders. Address Box 49, AMERICAN MACHINIST.

A machine shop, with modern equipment, heavy and light machinery, cranes of 20 tons capacity and 10,000 square feet of unoccupied floor space, would contract to manufacture any kind of machinery. Parties already having machinery built under contract might do well to write us for estimates. Box 62, AMERICAN MACHINIST.

DIXON'S SILICA
GRAPHITE PAINT

Will preserve a roof for TEN to FIFTEEN YEARS—perhaps longer, without repainting.

Unequaled for SMOKESTACKS, BOILER FRONTS, Etc.

SEND FOR CIRCULARS ON PAINTS AND PAINTING.

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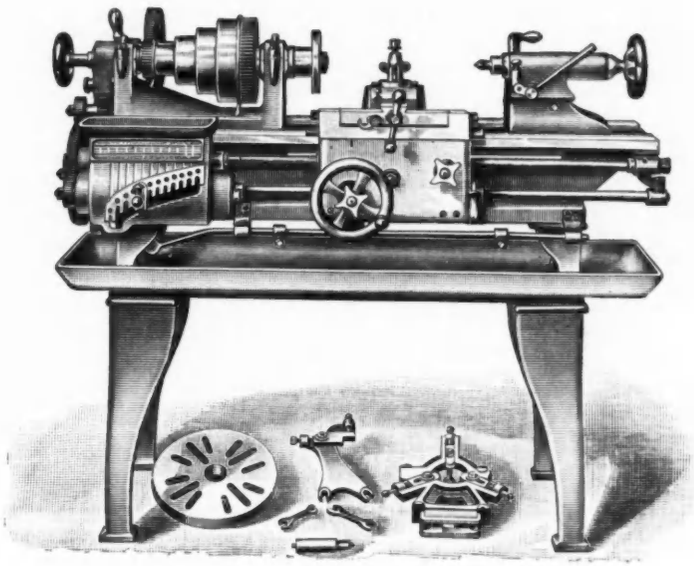
Jersey City, N. J.

Columbia University
in the City of New York.

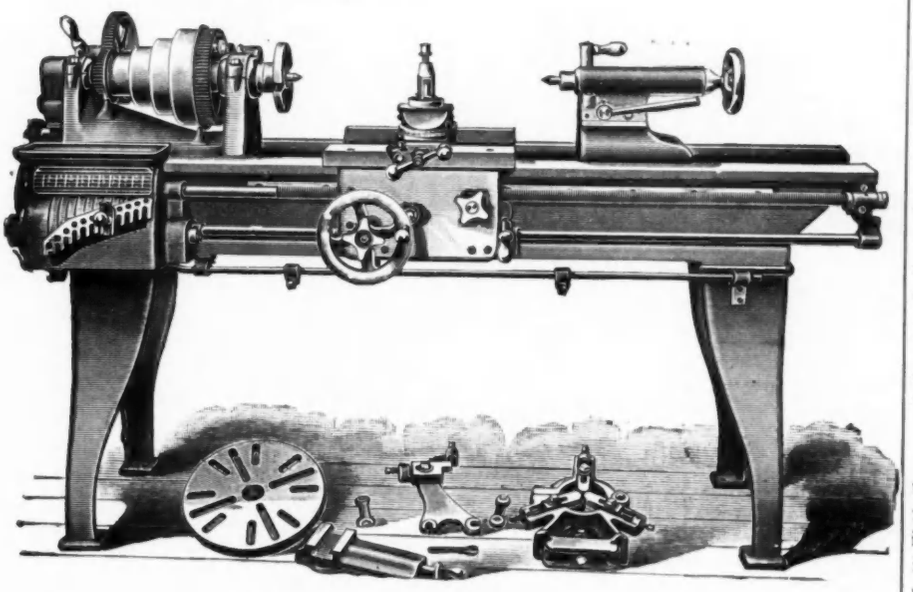
SCHOOL OF MINES,
SCHOOL OF CHEMISTRY,
SCHOOL OF ENGINEERING,
SCHOOL OF ARCHITECTURE,
SCHOOL OF PURE SCIENCE.

Four years' undergraduate courses and special facilities for graduate work in all departments. Circulars forwarded on application to the Secretary of the University.



12" Hendey-Norton Lathe

is fitted with drawing-in sleeve and American Watch Tool Co's standard chuck, used in making small taps, reamers, etc. Work finished first and cut from bar afterwards. No centering required. See carriage reverse lever by right-hand side of apron; no reaching for countershaft shipper required.



14" x 6' Hendey-Norton Lathe.

These lathes are modern, high-grade, practical tools, and are specially adapted for tool-room work. They have the Norton Attachment for screw cutting, giving 36 different threads and 36 different feeds with only two changes of gear and movement of lever in gear-box from one notch to the other. Note the automatic stop under apron. It will automatically stop carriage at any desired point in either direction; invaluable for internal or duplicate work. SEND FOR CATALOGUE.

The Hendey Machine Company,
Torrington, Conn.

Agents for the Pacific Coast, Pacific Tool & Supply Co., San Francisco, Cal.

European Agents: Chas. Churchill & Co., London and Birmingham, Eng.
Schuchardt & Schutte, Berlin and Vienna.
Eugen Soller, Basel, Switzerland.

(Continued from page 34.)

have more engine work on hand at present than for some time. The Watertown Engine Company are now running nearly to full capacity, and report a good business for the month of June, of which one of the most important domestic orders was for three 175 and one 100 horse-power engines for running dynamos, direct connected, at Carnegie Hall, of this city. There were also a 100 horse-power tandem compound, two 100 horse-power direct connected, and a 60 horse-power direct-connected, for various interests in this quarter. In the export field was a sale of a tandem compound to Russian parties, and inquiries are on hand from South Africa, etc. The Manhattan Refrigerating Company and the Pierrepont Apartments, both of Greater New York, have recently placed engine contracts, which, we understand, were for Ideal engines.

An installation on the Pacific Coast will comprise the machinery of a number of Eastern concerns. For the building of the San Francisco "Examiner," contracts have been let for six 75 horse-power Payne engines, Sprague elevators and Bullock dynamos, which latter will be directly connected to the presses.

FURTHER EXPORTS.

The Abendroth & Root Company, manufacturers of boilers, etc., report decided improvement in sales at home and abroad, and mention good orders for pipe from Toluca and Contreras, Mexico. The Lane & Bodley Company, Cincinnati, O., have taken an order for two vertical cross compound engines, to be exported for mining purposes. The Southwark Foundry & Machine Company have sold four large blast blowing engines for Russia. Hooven, Owens & Rentschler have just shipped a 600 horse-power triple-expansion engine for a paper mill in Japan.

ACTIVITY IN OTHER LINES.

The Mossberg & Granville Manufacturing Company, Providence, R. I., are reported extremely busy on roller bearings. When heard from, they were working night and day, and were expecting soon to be thirty days behindhand with their orders. They have had occasion, of late, to make considerable additions to their machinery equipment.

In connection with this may be mentioned a letter which we received from the Hyatt Roller Bearing Company, of Harrison, N. J., a short time since, stating that their factory was in full operation again after removal from Newark; that they were full of orders, and bidding on as many contracts as they could well take care of at their increased works. This would argue that roller bearings are at present very popular.

An export firm recently received an order from London for five pieces of machinery, to aggregate about $112,000, the most important piece being an electrical

traveling crane. Bids have been put in by manufacturers.

ADVANCING PRICES.

Part of the discount on boiler tubes has been withdrawn, and an effort is being made to raise the price of wrought-iron pipe also.

PITTSBURG REPORT FOR JUNE.

Business conditions in this territory have revived considerably of late. Mills have been put on longer hours, and have been pushed to a heavier capacity than for some months past. Everything looks promising for a greatly increased trade this fall. Many are of the firm belief that, if the Senators would settle down to business at Washington and get through with the Tariff bill, trade in all lines would assume better shape immediately, and that the prosperity so long talked about and so eagerly looked for, would be upon us.

Foreign trade has dropped off wonderfully. At this time last year machinery people were pretty well employed on foreign orders; but so far this year very few, if any, have been received. Domestic trade is such as to offer some encouragement. Numerous concerns are busy on specifications calling for machinery of heavy and light type for rolling-mill and foundry equipments. During the last month or two, many new concerns have sprung up in the Pittsburg territory for the manufacture of iron and steel and other products. Most of the orders for equipping the plant of Hamilton & Co., to be erected at West Newton, Pa., have been placed. Among the heavy machinery builders located in Pittsburg, the Frank Kneeland Machine Company presents a busy appearance. They have just received large contracts from important rolling mills in Ohio, Indiana and Pennsylvania, for shears of different design, hydraulic cranes, etc. Probably one of the largest contracts ever taken by a Pittsburg concern was that of the Westinghouse Electric & Manufacturing Company, to supply the St. Lawrence Construction Company, of New York, with 15,500,000 horse-power of generators for its plant at Massena, N. Y., the estimated cost being $750,000.

A party returning from Ohio states that many plants through Columbus, Cincinnati, Dayton and other points are running better than for some time past. The Rippel Manufacturing Company, at Columbus, has sufficient orders on the books to keep the plant busy for months to come; while the Lunkenheimer Company reports business as excellent, having orders for eight months ahead. The Stillwell-Bierce & Smith-Vaile Company, at Dayton, is keeping pace with the others, and has no cause to complain of dull trade.

All in all, there is a better feeling in every branch of trade, and this at a time which is generally known as the "quiet season of the year."

(Continued on page 37.)

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We are not given to indiscriminate indorsement, and when we say we recommend this Machine without reserve, our statement should have additional weignt.

Yours very truly,

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(Continued from page 36.)

Quotations.

NEW YORK, Saturday, July 3.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$12 00 @ $12 50
No. 2 foundry, Northern	11 00 @ 11 25
No. 2 plain, Northern	10 50 @ 11 00
Gray forge, Northern	9 75 @ 10 25
No. 1 foundry, Southern	10 50 @ 10 75
No. 2 foundry, Southern	10 00 @ 10 25
No. 3 foundry, Southern	9 75 @ 10 00
No. 1 soft, Southern	10 75 @ 11 00
No. 2 soft, Southern	— @ 10 50
Foundry forge, or No. 4, South'n	9 50 @ 9 75

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.00 @ 1.05c.; refined, 1.10 @ 1.25c. Store prices: Common, 1.25 @ 1.35c.; refined, 1.35 @ 1.45c.

Tool Steel—Ordinary sizes, standard quality, 6 @ 7c., with some brands perhaps a little less; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.50c.

Cold Rolled Steel Shafting—Base size, 2.40c., in small lots, from store.

Copper—Carload lots, Lake Superior ingot, 11¼c.; electrolytic, 11 @ 11⅛c.; casting copper, 10⅝ @ 11c.

Pig Lead—In carload lots, 3.65c., f. o. b., New York.

Pig Tin—For 5 and 10-ton lots, 14.10c., f. o. b.

Spelter—In carload lots, New York delivery, 4.25 @ 4.35c., f. o. b.

Antimony—6⅜ @ 7½c., according to brand.

Lard Oil—Prime city, present make, commercial quality, in wholesale lots, 35 @ 37c.

▲ ▲ ▲

Manufactures.

At Landisville, Pa., the Landisville ore mines will place new machinery.

The Arcade Mills, at Rock Hill, S. C., are to have extra machinery installed.

At New Orleans, La., the rice mill of Ernst & Co. has been destroyed by fire.

The works of the Tampa (Fla.) Gas Company are to be considerably enlarged.

At Lynchburg, Pa., the Lynchburg Light & Heat Company has been incorporated.

At Rumford Falls, Me., the R. F. & R. L. R. R. contemplate the erection of a new repair shop.

At Chicago, Ill., Stewart & Co. have been incorporated. Those interested are Monroe L. Willard and Henry M. Wolf.

At Newport News, Va., James T. Mayer and J. Crossley are erecting a factory for the manufacture of a patent lathe box.

The factory of J. N. Gorman & Co., Greenville, N. C., will have additions erected, making the capacity double its present size.

At Ft. Wayne, Ind., the Ft. Wayne Foundry & Machine Company has been formed. The directors are J. H. Bass, C. T. Strawbridge, F. S. Lightfoot and J. M. Barrett.

At Lincoln, Neb., the National Milling Machinery Company has been incorporated with a capital of $100,000. The incorporators are E. N. Morse, F. F. Brown, A. Gibson, E. Anderson, etc.

The Fuller & Warren Combustion Company has been formed at Chicago to engage in the manufacture of furnaces, boilers, etc. Incorporators: Fred. Hawkins, Andrew H. Burnett and Ralph S. Hawkins.

Negotiations have been closed which will mean the erection of a plant at Deckertown, N. J., by the Mellor Manufacturing Company. The building will be 50 x 300 feet, and it is expected the plant will be erected in a very short time.

The foundations have been laid for a manufacturing plant near the West River, New Haven, Conn., the erection of which will be started very soon. The plant is to be used by Lucien Sanderson for the manufacture and sale of agricultural chemicals. The main building is to be 180 x 125 feet and two stories high. It will contain the factory, storage and shipping rooms.

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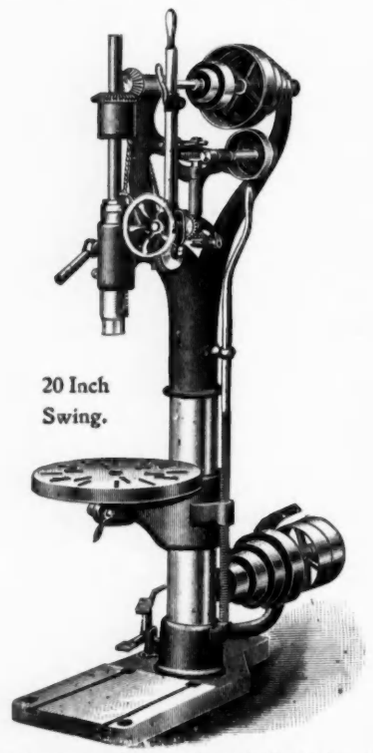

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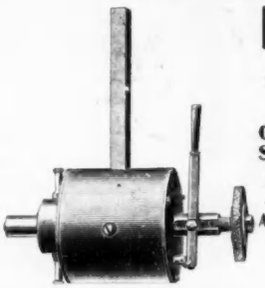

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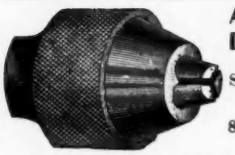

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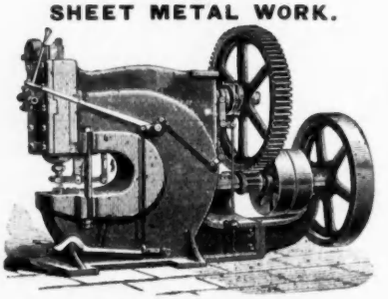

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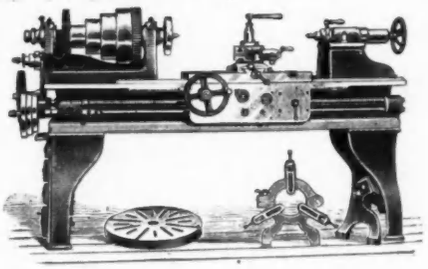

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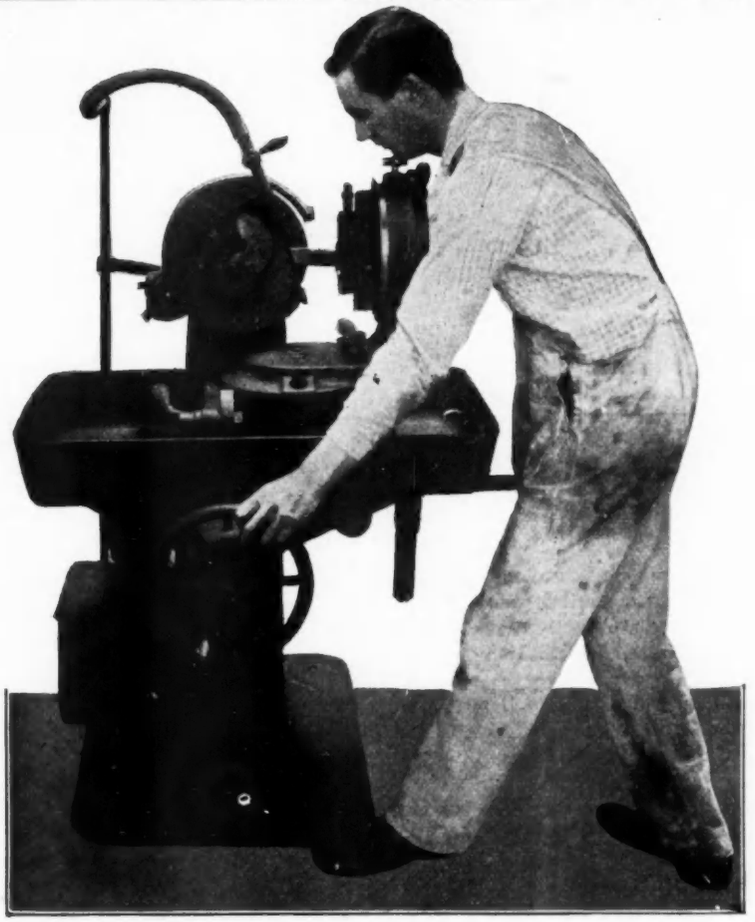

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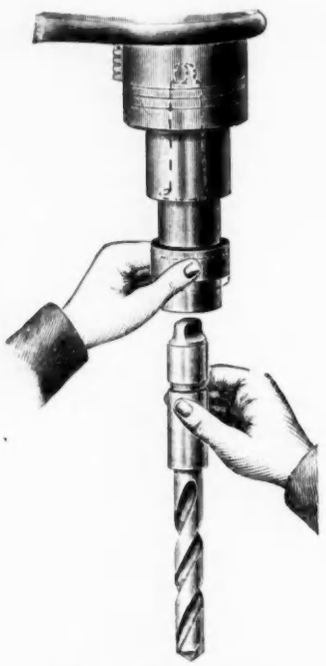

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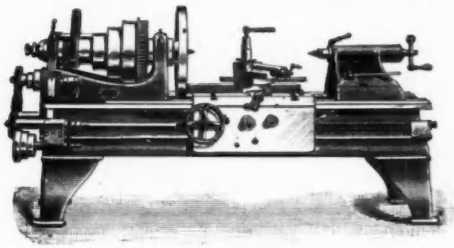

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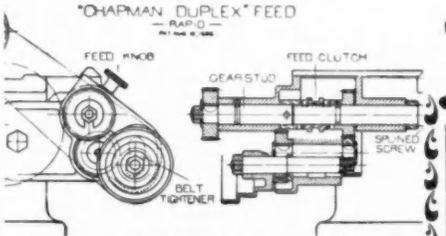

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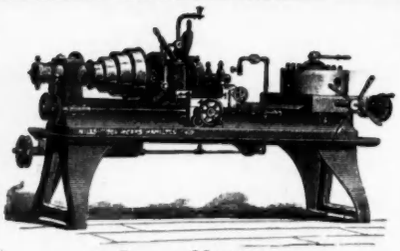

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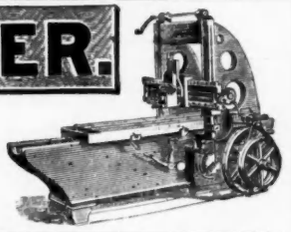

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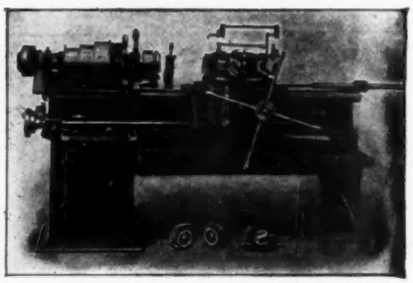

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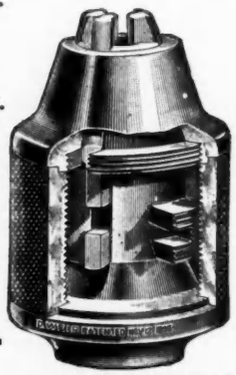

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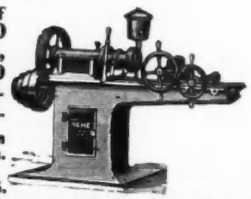

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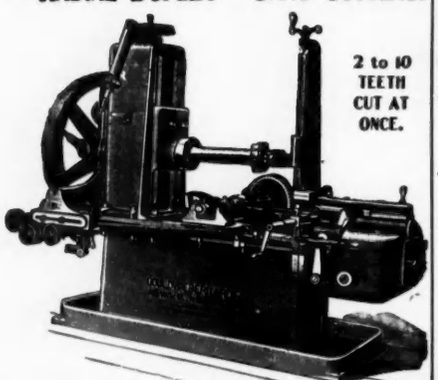

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